Chapter Four: Current and Projected Use of the Cook Inlet Area

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A. Historical Background

At the time of first European contact, Tanaina Indians occupied the Cook Inlet area. Evidence from the Yukon Island site in Kachemak Bay shows that lower Cook Inlet was occupied by Eskimos from about 1500 BC to 1000 AD and then by Athabaskan Indians, probably the ancestors of the Tanaina who moved into the coastal area from the Interior (AEIDC, 1974:177).

Tanaina Indian groups entered the Cook Inlet subregion through the Alaska Range from the west, primarily through Rainy, Merrill, and Lake Clark Passes, and continued this southeastward migration until most of their villages were located on or near the major salmon producing streams of Cook Inlet (AEIDC, 1974:177). Tanaina villages consisted of four or five large semi-subterranean log structures; each occupied by several nuclear families belonging to the same clan. Clan dwellings were occupied throughout the winter and early spring. During the summer, families relocated to fish camps. In late summer and early fall, hunting groups traveled to the mountains, and occupied traditional, temporary campsites along established travel routes (ADF&G, 1985b:868).

Captain Cook's voyage into Cook Inlet in 1778 is the most celebrated written recording of European contact with the Tanaina. Russian fur traders and missionaries of the Russian Orthodox Church were the first to establish non-Native outposts in the region in the late eighteenth and early nineteenth centuries. These religious and cultural ties continue today. The Russian foothold in Cook Inlet survived early Tanaina resistance and hostilities, and eventually gained some acceptance. Epidemics devastated the Tanaina population during the 1830's. Survivors commonly abandoned traditional villages and concentrated in settlements at places such as Knik, Susitna Station, and Tyonek (ADF&G, 1985b:869).

The Russian period lasted until 1867 when Alaska was purchased by the United Sates. The introduction of the tin can dramatically changed salmon processing and shipping. A cannery was established at Kasilof in 1882. A saltery built near Tyonek serviced the emerging Cook Inlet commercial fishing industry (ADF&G, 1985b:868). In the first 20 years of the 20th century, canneries were established throughout coastal Alaska (AEIDC, 1974:181).

The gold rush brought settlement to mining districts in Alaska, but most of the Cook Inlet region was inaccessible and settlement of the region was low. The construction of the Alaska Railroad brought large numbers of construction workers into the Cook Inlet region. Anchorage at Ship Creek was founded as a railroad construction camp in 1914. Fish camps in the Anchorage area were also in use by local residents. By the time the railroad was completed in 1923 many more settlers had arrived from Europe and the United States. However, many of these newly arrived residents left Alaska in 1917 to fight in World War I and did not return (AEIDC, 1974:181).

Population growth in the Cook Inlet region was very slow until World War II. A major influx of settlers colonized the Matanuska Valley in 1935 to create an American farming community there. While the early settlers experienced many hardships, eventually several thriving dairy farms were founded to meet local residents' needs. The community of Palmer rapidly emerged as the center of the colony (AEIDC, 1974:181).

The establishment of military bases at Anchorage in 1940 brought the first significant wave of migration to Alaska since the building of the railroad (AEIDC, 1974:181). Base construction activities and newly stationed troops caused Anchorage's population to triple between 1940 and 1945. As the state's transportation and financial hub, Anchorage demonstrated the ability to benefit from economic activity anywhere in the state (ADF&G, 1985b:875).

The completion of the Glenn Highway in 1942, Sterling and Seward Highways in 1950 and 1951 and the George Parks Highway in 1971 opened central Alaska to fishing, hunting and tourism. A lucrative king crab fishery emerged in Kodiak in the 1950s, which provided the necessary economic base for the development of other fisheries in shrimp and tanner crab, in addition to salmon harvesting. Oil was found on the Kenai Peninsula in 1957. The city of Kenai and the surrounding area immediately began a period of rapid growth. In 1958, convinced that the territory of Alaska had the resources to sustain its people, Congress passes the Statehood Act, making Alaska the 49th state admitted to the Union. Oil development in Cook Inlet sprouted with the building of offshore platforms north of the Forelands between 1966 and 1968. (AEIDC, 1974:182).

On Good Friday 1964, a long earthquake shattered coastal Alaska. Communities reconstructed and relocated in part due to federal aid. The discovery of oil at Prudhoe Bay in 1968 initiated another wave of settlement. The construction of the Trans-Alaska Pipeline in the 1970's fueled the growth of service-related industries, financial institutions, government, and in more recent years, tourism, by providing funding for government services and the construction of roads, docks, and airports (AEIDC, 1974).

In 1971, Congress passed the Alaska Native Claims Settlement Act (ANCSA), granting title to more than 40 million acres of land and providing more than $900 million to Alaska Natives. The Act also set up a corporate ownership of assets with Native residents as shareholders.

In 1980, the state legislature established the Alaska Permanent Fund dedicating one quarter of all royalty oil revenues for future Alaskans. With the passing of the Alaska Lands Act of 1980, Congress set aside more than 100 million acres of Alaska for national wildlife refuges, national wild and scenic rivers, national forests and national parks. The population of Alaska has grown from 103,000 in 1946 to more than 600,000 today. (ANB, 1992)(ADF&G, 1985b:875).

B. Current and Projected Use

Commercial uses of the Cook Inlet and Susitna regions include fishing, fish processing, guide and taxi services, timber harvesting and restoration, mining and reclamation, agriculture, mariculture, tourism by residents and non-residents, transportation, public works construction, trade, private commercial and residential development, and petroleum exploration, development, production, transportation, and support services. Additionally, state and federal government, communities and municipalities, and ports and harbors, utilize the region's air, land and water resources. Recreation and subsistence activities are also supported by Cook Inlet habitat, fish and wildlife.

Demand for natural resources should increase in the coming years to support steady population growth. Changes in wage and salary employment may be a traceable indicator used to estimate current and future uses of the tri-borough region. Some sectors of Alaska's economy are projected to grow in coming years, while others could decline. See Table 4.1, Alaska Wage and Salary Employment 1994 and 2005.

Table 4.1 Alaska Wage and Salary Employment 1994 and 2005

	1994	2005 (projected)	Annual Average Growth Rate (%)
Goods Producing	39,600	43,400	0.8
Mining	10,700	13,100	1.9
Construction	12,300	14,400	1.4
Manufacturing	16,600	15,900	-0.4
Seafood Processing	10,300	9,500	-0.7
Service Producing	219,800	251,700	1.2
TCU*	23,300	29,900	2.3
Wholesale	8,300	9,100	0.8
Retail	44,400	52,200	1.5
Fire**	11,900	11,500	-0.3
Services and Misc.	58,000	76,800	2.6
Government	73,900	72,200	-0.2
Federal Govt.	18,700	17,500	-0.6
State Govt.	21,600	21,000	-0.3
Local Govt.	33,500	33,700	0.1
Total	259,400	295,100	1.2

*Transportation, Communications, and Utilities. ** Finance, Insurance, and Real Estate. Source: AET, 1996

Government spending is an integral part of Alaska's economy. Public works spending varies from year to year, depending on the price of oil and revenue forecasts. The state spends between $300 and $700 million annually on capital projects. Additionally, the state receives millions each year to spend on highway improvements and maintenance. State and federal monies also fund water and sewer projects. New home construction has experienced moderate growth in recent years with residential developments sprouting up in Anchorage and along the highways in the KPB and MSB. Logging roads on CIRI land south of Tustemena Lake may be used for new settlement. Nearly all construction material is imported to Alaska from the Lower 48 states via the Ports of Anchorage and Nikiski, and the Alcan Highway.

1. People and Economy

This section describes the populations and economies of the three boroughs that make up the area considered in this finding. This includes data on population size and distribution, employment by industry, earnings by industry, housing, government, education, and taxation.

In the summer of 1990, the U.S. Census Bureau staff surveyed incorporated boroughs, municipalities, and cities as well as rural populations of Alaska. Unorganized or unincorporated populations were grouped into geographic units called Census Designated Places (CDP's) or Alaska Native Village Statistical Areas (ANVSA's) to optimize statistical reliability. However, sample frequency varied among communities and some housing and income statistics may not reflect current population size, income, or quality of life indicators. Statistics on Alaska's population, occupations, and earnings are estimated by ADOL, and used by other state agencies, such as ADCRA, ADOR, and ADOT. Employment and population estimates, and funding formulas for state and federal programs are based on census information, permanent fund dividend receipts, tax returns, and business and vehicle licenses (ADOL, 1996b).

Certain portions of Alaska's employed population are excluded from unemployment insurance coverage, and no reliable method for collecting employment or payroll information is available for these individuals. However, these earnings are an important component of the Cook Inlet economy. The largest segments of the employed population excluded from ADOL data include (ADOL, 1996b):

- Self employed individuals (any self-reported earnings)
- Fishers (non-processing earnings. See section on commercial fishing)

- Unpaid family help
- Domestics
- Most individuals engaged in agriculture

Information on commercial value for these sectors is available from the USDOC and Limited Entry Commission and is presented in the following sections where appropriate. When there is a lack of quantifiable information, a multiplier is usually computed against the nearest indicator of commercial value, such as ex-vessel prices (prices paid to fishers).

Aside from state and federal sources, municipalities derive revenues from sales taxes, property taxes, enterprise, and other revenues. Enterprise income includes any self-sustaining venture, such as garbage collection, water, and sewer. Revenue from community owned enterprises comprise a substantial portion of total revenues generated locally, such as property and sales taxes. Incorporated communities may levy a tax and prescribe tax zones under AS 29.45.080. Municipal taxes help offset increased demand for public services during the summer months. Unincorporated communities without a property or sales tax base are more dependent on state general fund revenues to provide public services to residents. Only organized communities may collect property and sales taxes.

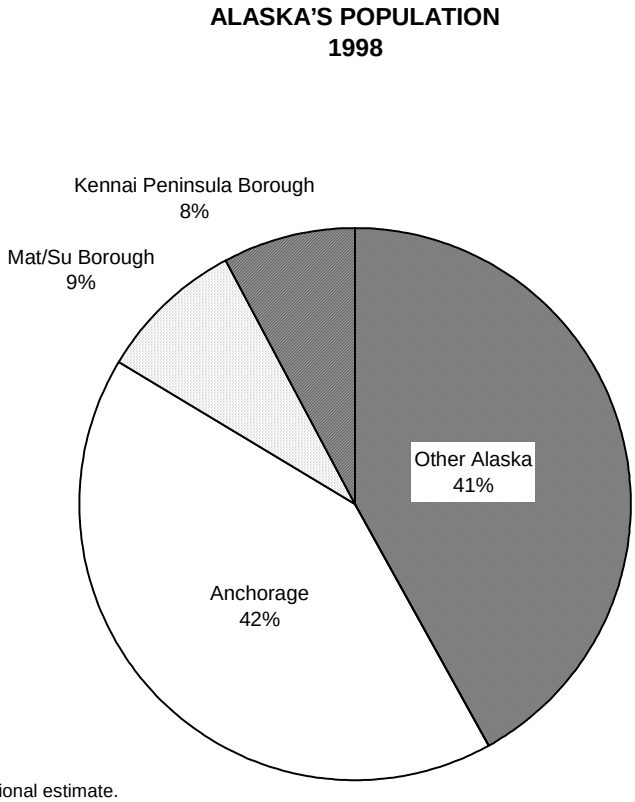
ADOL estimates the 1998 state population at 621,400. Alaska's population grew an average of 1.5 percent per year in the period 1990 to 1998. Alaska's population continues to increase now that reductions in military out-migration have ended. Natural rural population increases are expected to continue to grow Alaska's population (ADOL, 1998a).

Approximately 60 percent of the state's population live within the area considered in this finding, mostly in three principal boroughs (See Figure 4.1). Since 1990, the MSB, KPB, and MOA have had average annual growth rates of 3.8, 2.2, and 1.8 percent respectively. Next to the North Slope Borough (2.8 percent), these are the highest population growth rates in the state (ADOL, 1998). Several communities within the sale area have experienced the highest average annual growth rates in the state since 1990. These include Meadow Lakes (9.1%), Big Lake (5.7%), Sterling (5.5%), Palmer (4.4%), Anchor Point (4.0%), Butte (3.0%), Lazy Mountain (3.0%), Wasilla (2.7%), Ridgeway (2.2%), and Soldotna (2.2%) (ADOL, 1997). Communities located within or near the Cook Inlet Areawide region are depicted in Figure 4.2 Borough and Community Boundaries.

a. Municipality of Anchorage

Population. More than half of Alaska's population lives in urban settings, with two out of five residents living in the municipality and greater Anchorage area (ADOL, 1997). The population of Anchorage is culturally diverse and includes one of the largest concentrations of Alaska Natives in the state. The July 1998 population of the Anchorage Borough was 258,782 (ADOL, 1998a). In 1996, pre-school and school age children under 17 made up 30 percent of Anchorage's population with nearly the same percentage in the 50 to 65 age group. In 1996, 5 percent of Anchorage residents were seniors (MOA, 1997:19). Population estimates for the Anchorage Borough include the communities of Girdwood, Bird, Indian, Eagle River, Birchwood, and Chugiak. Eklutna, counted separately from Anchorage, had an estimated 436 residents in 1998 (ADOL, 1998b).

Figure 4.1 Alaska's Population



Source: ADOL July 1998 provisional estimate.

Economy and Housing. Anchorage is the center of trade, finance and transportation in Alaska. Many Alaska industries have headquarters in Anchorage including oil and gas, construction and industrial services, communications, and government. Seventy percent of Alaska's 100 largest private employers are headquartered in Anchorage (MOA, 1997:99). More than half of Anchorage's 7,500 businesses employ between 1 and 4 persons (MOA, 1997:94). Many firms operating in Anchorage employ more than 1,000 employees, including Carr-Gottstein Foods, Providence Hospital, ARCO Alaska Inc., Fred Meyer, VECO, Wal-Mart/Sam's Club, Alaska Airlines, National Bank of Alaska, BP Exploration, and Alyeska Pipeline (MOA, 1997:99). More than 10,000 military personnel and their dependents are stationed at Fort Richardson and Elmendorf Air Force Base (MOA, 1997:36). About 10,000 MSB residents work in Anchorage (MSB, 1997b:57). About 850 residents held commercial fishing permits in 1996 (ADCRA, 1998). In 1996, there were more than 19,000 Native Americans living in the MOA, most of which engage in or may be eligible for subsistence harvesting (ADOL, 1996b:68).

Oil revenues and government provide a skeleton for the Anchorage private sector. The 1997 Employment by Industry is depicted in Figure 4.3 (ADOL, 1998b).

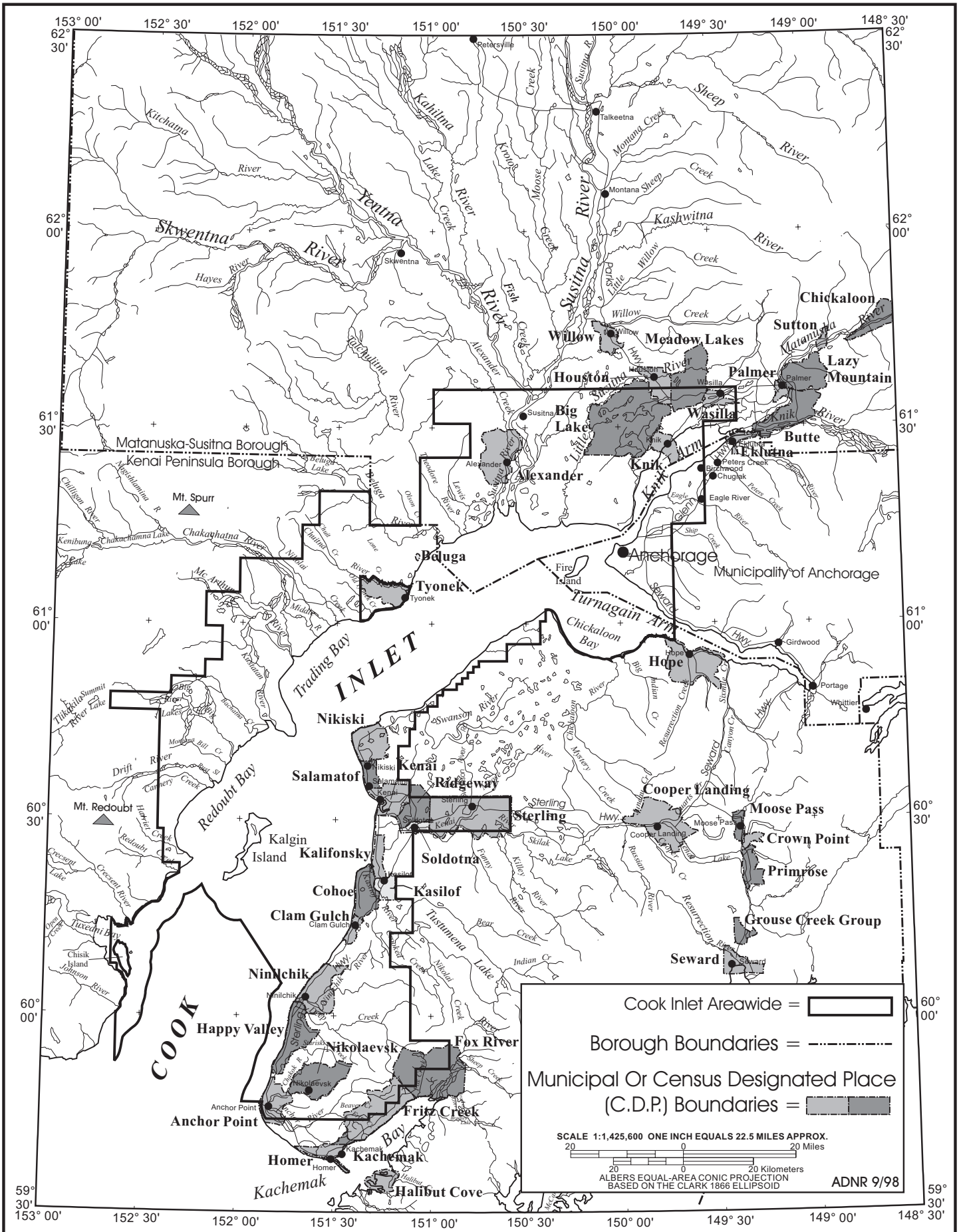


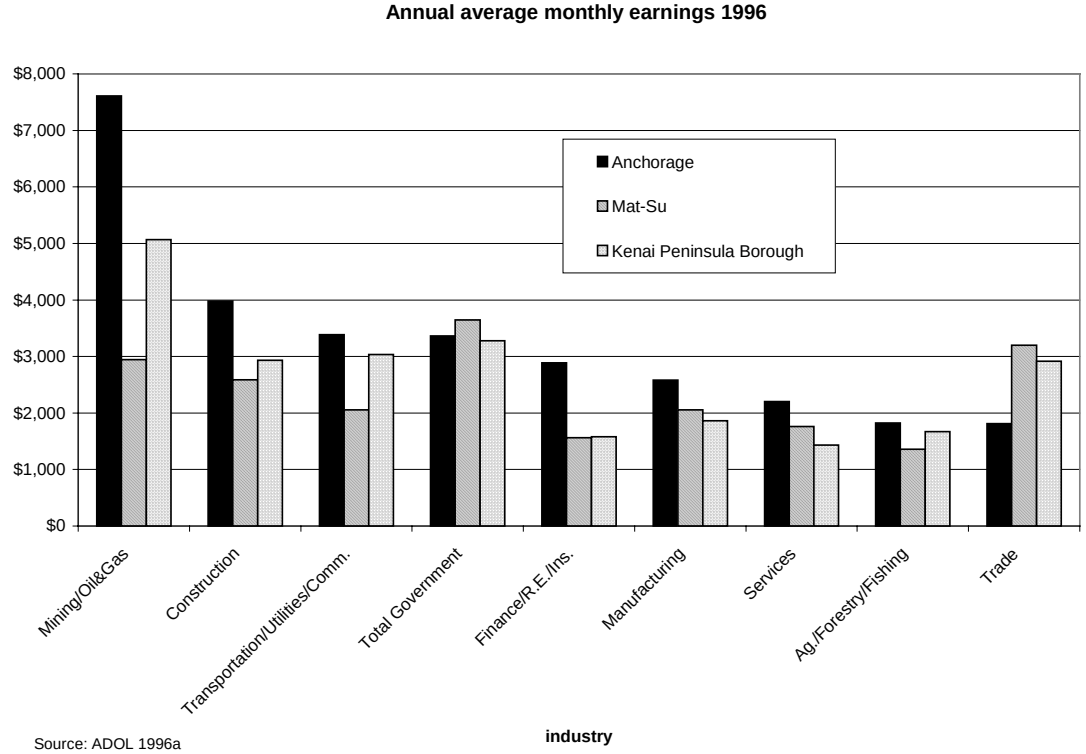
FIGURE 4.2 Borough And Community Boundaries

Figure 4.3 1997 TriBorough Employment by Industry

	Anchorage	MatSu	Kenai PB
Total Industries	122,081	10,685	16,328
Mining (includes oil and gas)	2,446	19	1,152
Construction	6,952	794	886
Manufacturing	1,957	133	1,908
Trans.Comm. & Util.	12,535	844	1,047
Trade	30,330	2,768	3,597
Wholesale Trade	5,953	240	465
Retail Trade	24,377	2,528	3,132
Finance	6,322	323	368
Services	33,864	2,874	3,122
Government	26,986	2,806	4,162
Federal	9,953	138	415
State	8,100	847	1,041
Local	8,933	1,821	2,706
Misc. & Unclassified	689	127	86

Between 1992 and 1997, Anchorage experienced a $103 million retail expansion boom that added 1.6 million square feet of retail space to the city (MOA, 1997:116). In recent years, a hotel construction boom has also fueled the construction and services sector, and now meets demand for tourism infrastructure. An oilfield module assembly plant began operations at the Port of Anchorage for the Northstar Project in 1997. Commercial and tourism development has been proposed for Ship Creek waterfront and a 16-theatre cinema has been built in mid-town. A new hotel was added to the downtown area and two new ones are under

Figure 4.4 1996 Tri-Borough Earnings by Industry.



Source: ADOL 1996a

construction. Increased demand for airfreight service prompted Federal Express to base operations in Anchorage, and currently, demand for jet fuel exceeds in-state production capacity. Expansion of the Anchorage International Airport and construction of a Native American cultural center are in the design phase.

Annual average monthly earnings range from about $1,500 for the retail trade industry to $7,105 for the mining industry. Anchorage average monthly earnings are presented in Figure 4.4. In 1996, Anchorage residents earned more than $4 billion dollars in wages of which about 25 percent came from government jobs.

While unemployment rates fluctuate in Alaska with the seasons, the September 1997 unemployment rate in Anchorage was five percent; slightly higher than the previous year, but below the statewide average of six percent (AET, 1997). The May 1998 unemployment rate of 5.8 percent for Alaska was the lowest in 25 years (AET, August 1998).

In 1990, there were a total of 56,503 family households in the Municipality of Anchorage with an average of 2.68 persons per house (USDOC, 1990). The 1990 median household income for the borough was $43,946 (USDOC, 1990), the median home value was $109,700. In the census year, 43,672 housing units were owner-occupied, and 39,030 were rented with a median rent rate of $528 per month (USDOC, 1990). In 1990, 81 percent of Anchorage homes were heated with natural gas and 14 percent used electricity. In the census year, 86 percent of housing units were connected to the city's municipal water source, and the remainder had individual water wells (USDOC, 1990).

Government and Education. The Municipality of Anchorage has no sales tax, but has a hotel/motel tax of 8 percent and taxes tobacco products. The full value of taxable property in Anchorage for 1997 was almost $14 billion (Crawford, 1998). In 1997, the municipality took in $881,786,974 in total operating revenues of which $578,086, 217 (66 percent) was generated locally. Total operating expenditures for the same year were $592,710,842 of which $308,432,000 (52%) was spent on education. The Anchorage School District employed 3.087 teachers and had 48,888 students in 90 schools. In 1990, the number of residents age 25+ that held a high school diploma exceeded 90 percent, and the number holding a college degree was 26.9 percent (ADOL, 1996b:88)(ADCRA, 1998).

b. Kenai Peninsula Borough

Population. Nearly every community of the Kenai Peninsula Borough has experienced fast-paced population growth in recent years with the exception of populations off the highway corridor. The 1997 provisional population of the KPB is estimated at 52,448. About 17 percent of KPB residents do not live in a community or Census Designated Place (CDP) (ADOL, 1997). Most communities are unincorporated and rely on state funding to provide services. Between 1980 and 1990, the population of the KPB grew an average of 4.7 percent per year from 25,282 to 40,802 (ADOL 1993:p.41). The KPB population growth rate has been consistently higher than the state average throughout the 1990s increasing the demand for land, energy and public services. Population figures for communities within the KPB are presented in Table 4.2.

Table 4.2 KPB Community Profiles

Community	1990 population	1998 population	Incorporation Type	Land Area (sq. mi.)
Anchor Point	866	1,188	Unincorporated	20
Clam Gulch	79	108	Unincorporated	5
Cohoe	508	602	Unincorporated	27
Cooper Landing	243	283	Unincorporated	55
Crown Point	62	102	Unincorporated	6
Fox River	382	439	Unincorporated	85
Fritz Creek	1,426	1,998	Unincorporated	61

Community	1990 population	1998 population	Incorporation Type	Land Area (sq. mi.)
Halibut Cove	78	74	Unincorporated	7
Happy Valley	309	400	Unincorporated	33
Homer	3,660	4,155	1st Class City	10
Hope	161	135	Unincorporated	48
Jakolof Bay	28	51	Unincorporated	20
Kachemak	365	419	2nd Class City	1
Kalifonsky	285	338	Unincorporated	10
Kasilof	383	558	Unincorporated	11
Kenai	6,327	7,068	Home Rule City	28
Kenai Peninsula Borough	40,802	48,815	2nd Class Borough	16,078
Moose Pass	81	134	Unincorporated	8
Nanwalek	158	180	Unincorporated	7
Nikiski	2,743	3,060	Unincorporated	28
Nikolaevsk	371	467	Unincorporated	40
Ninilchik	456	675	Unincorporated	38
Port Graham	166	186	Unincorporated	5
Primrose	63	62	Unincorporated	16
Ridgeway	2,018	2,381	Unincorporated	21
Salamatof	999	1,135	Unincorporated	5
Seldovia	316	281	1st Class City	not available
Seward	2,699	3,040	Home Rule City	15
Soldotna	3,482	4,134	1st Class City	6
Sterling	3,802	5,888	Unincorporated	85
Tyonek	154	152	Unincorporated	22
Remainder of KPB	7,409	9,122		

Source: ADOL 1998b

Economy and Housing. The economy of the Kenai Borough is diverse. In 1990, 78 percent of all jobs came from the private sector, while 3 percent, 7 percent, and 11 percent were federal, state and local government jobs, respectively (USDOC, 1990). In 1994, the services sector[1] employed the largest number of persons followed by retail trade, local government, manufacturing, and oil and gas extraction (ADOL, 1994b). Two years later government employed the largest number of individuals followed by the trade and services sectors (ADOL, 1996a). KPB employment by industry is depicted in Figure 4.3.

In terms of total payroll, the largest source of reported non-fishing employment income for the KPB in 1996 came from local government ($89 million), (ADOL, 1996a). Manufacturing was the second largest source ($73 million), due in part to seasonal fish processing. Oil and gas extraction provided $59 million in employment earnings for 1996 and had the highest average annual earnings of any industry (ADOL, 1996a). Other important industries included services ($55 million), retail trade ($48 million), state government ($38 million), construction ($31 million), and others (ADOL, 1996a). KPB annual average monthly earnings for 1996 are depicted in Figure 4.4.

In April of 1990, 67 percent of the population aged 16 years and older participated in a civilian labor force of 19,220. The Alaska Department of Labor estimates the labor force to grow to 26,707 persons by July 2000 (ADOL, 1992:p.83). While unemployment rates fluctuate in Alaska with the seasons, the September

[1] The services sector includes hotels and other lodging places, personal services, business services, auto repair, misc. repair, motion pictures, amusement and recreation services, health services, legal services, educational services, social services, museums, botanical gardens, membership organizations, engineering and management services, private household services, and miscellaneous services.

1997 preliminary estimate for unemployment in the KPB was 8.8 percent; significantly lower than the previous year, yet higher than the statewide average of six percent (AET, 1997).

In 1990, there were a total of 14,250 family households in the KPB (ADOL, 1993:p.103). Resident occupancy for the borough was on average 2.79 persons per household (ADOL, 1991:p.85). The 1990 median household income for the borough was $42,403 and per capita income $18,173. Both are slightly above state averages (ADOL, 1993:p.63). The 1990 median home values vary from community to community (ADOL, 1994b).

Just over forty percent (6,285) of KPB households in 1993 used natural gas as their primary home heating fuel, mostly in a single gas company's Kenai and Soldotna service area. Oil heated 28 percent (4,343) of households in the borough followed by wood/other at 31 percent (3,257) and electricity at 10 percent (1,551) (ISER, 1995).

Government and Education. The borough has a three-percent sales tax and a property tax rate of 8.55 mills. The full value of all property in the borough is almost $4 billion (Crawford, 1998). Communities with sales taxes such as Kenai, Soldotna, Homer, and Seldovia offset seasonal increases in public service demand.

Primary and secondary education is mostly paid for with state general funds passed through to the KPB, which operates the borough-wide school district. There are about 25 elementary and 17 middle or high schools in the KPB with a 1996 enrollment of 10,229 students (KPBSD, 1996).

c. Matanuska - Susitna Borough

Population. ADOL estimated the July 1998 population of the MSB at 54,526; a 4.5 percent increase over 1997 and the highest growth rate for any borough in the state. The fastest growing communities in the MSB include Meadow Lakes, Butte, Big Lake, Lazy Mountain, and Wasilla. This rapid increase is largely due to an influx of people from Anchorage (ADOL, 1998a). Population figures for communities within the MSB are presented in Table 4.3. As in the KPB, most communities are unincorporated. Nearly 57 percent of MSB residents do not live in a community or CDP (ADOL, 1996b).

Table 4.3 MSB Community Profiles

Community	1990 population	1998 population	Incorporation Type	Land Area
Alexander	40	36	Unincorporated	57 sq. mi.
Big Lake	1,477	2,228	Unincorporated	133 sq. mi.
Butte	2.039	2,654	Unincorporated	49 sq. mi.
Chase	38	56	Unincorporated	36 sq. mi.
Chickaloon	145	208	Unincorporated	47 sq. mi.
Houston	697	939	Second Class City	24 sq. mi.
Knik	272	461	Unincorporated	10 sq. mi.
Lazy Mountain	838	1,091	Unincorporated	41 sq. mi.
Mat-Su Borough	39,683	54,526	Second Class Borough	24,694 sq. mi.
Meadow Lakes	2,374	4,823	Unincorporated	54 sq. mi.
Palmer	2,866	4,161	Home Rule City	4 sq. mi.
Wasilla	4,028	5,134	First Class City	11 sq. mi.
Willow	285	430	Unincorporated	14 sq. mi.
Remainder of MSB	24,584	32,305		

Source: ADOL, 1998b

Economy and Housing. The economy of the MSB is dependent on commuter employment with Anchorage. About forty percent of the MSB's 28,300 work force commutes to Anchorage. In 1996, the retail trade, services and government sectors employed roughly the same number of individuals (ADOL, 1996a). The 1997 employment by industry is depicted in Figure 4.3.

In 1996, Matanuska-Susitna residents earned about $280 million in wages of which about 38 percent came from government jobs. Two-thirds of that came from local government. The services sector of the economy generated the second most earnings ($55 million), followed by trade ($51 million); transportation, communications, and utilities ($51 million); construction ($20 million); finance, insurance, and real estate ($7 million); manufacturing ($3 million); and agriculture ($2 million) (ADOL, 1996a). Average annual monthly earnings by industry are depicted in Figure 4.4.

In 1990, there were 2.92 persons per house and median family income was $45,252. Census takers counted 20,953 housing units of which 13,394 were occupied. The 1990 median home value was $71,500 and the median rent paid was $430/month (USDOC, 1990). While unemployment rates fluctuate in Alaska with the seasons, the September 1997 preliminary estimate for unemployment in the MSB was 8.2 percent; slightly lower than the previous year, and above the statewide average of six percent (AET, 1997).

Government and Education. The Matanuska-Susitna Borough is a second class borough incorporated in 1964. The borough has no sales tax. The 1997 assessed value of property was $2.5 billion (Crawford, 1998). Palmer, a home rule city incorporated in 1951, has a 3 percent sales tax. Wasilla, a first class city since 1974, has a 2 percent sales tax. Houston is a second class city (1966) and has no sales tax. In 1996, 11,611 students were enrolled in MSB schools (MSB, 1997a:5)

More than 60 percent of all Alaskans live in the sale region. Anchorage is the center of trade, finance, and services and is home to many of Alaska's largest employers. Oil revenues and government provide a skeleton for a growing economy linked with the Kenai Peninsula. Additionally, thousands of Matanuska-Susitna Borough residents work in Anchorage. In all three boroughs, homes and businesses get electric power and heat energy from Cook Inlet gas. Local energy and state revenue support allow the Tri-borough economy to continue to grow and provide its neighborhoods with roads, utilities, public safety, and schools. Growing communities depend on a strong local tax base and some government spending to pay for education and reduce unemployment.

2. Commercial Activity

a. Fishing

Commercial fishers harvest all five species of pacific salmon in Cook Inlet each summer. Halibut, groundfish, herring, and razor clams are also taken from the lower Inlet and Kamishak Bay. Fish are delivered to docks at Anchorage, Nikiski, Ninilchik, Kenai, Kasilof and Homer for processing. Many commercial fishermen living in the Cook inlet Areawide region participate in other fisheries around the state, such as in Bristol Bay and Shelikof Strait. Virtually all salmon in the Cook Inlet Areawide region must pass through Cook Inlet.

Cook Inlet is divided into two main management areas; Upper Cook Inlet and Lower Cook Inlet. The Upper Cook Inlet management area is divided into the Central District (from Anchor Point north to the Forelands) and the Northern District (north of the Central District).

The most significant commercial harvest activity is the salmon fishery, which focuses primarily on sockeye salmon. In 1997, 4.1 million sockeye salmon were harvested in the Upper Cook Inlet management

area having an approximate ex-vessel value of $31 million (Table 4.4). Of this, the drift fleet harvested about 53 percent and the rest went into set nets (Ruesch & Fox, 1998:48). This catch represents the eighth highest catch on record and is approximately 1.8 million fish higher than the long-term (44-year) average, but less than the 10-year average of 4.6 million fish (Ruesch & Fox, 1998:5).

Table 4.4 1990-1997 Harvest and Approximate Ex-Vessel Value of the Commercial Salmon Fishery in Upper Cook Inlet

Commercial Harvest							
Year	Chinook	Sockeye	Coho	Even Year Pink	Odd Year Pink	Chum	Total
1990	16,105	3,604,064	500,634	603,630		351,197	5,075,630
1991	13,535	2,177,576	425,724		14,663	280,223	2,911,721
1992	17,171	9,108,340	468,911	695,859		274,303	10,564,584
1993	18,719	4,754,698	306,822		100,918	122,767	5,303,924
1994	20,260	3,567,392	580,567	520,481		299,300	4,988,000
1995	17857	2,951,827	446,954		133,575	529,422	4,079,635
1996	14,248	3,888,778	321,411	242,911		156,457	4,623,805
1997	13,235	4,176,696	152,404		70,928	103,036	4,516,299

Ex-Vessel Value							
Year	Chinook	Sockeye	Coho	Even Year Pink	Odd Year Pink	Chum	Total
1990	$436,822	35,804,485	2,419,202	512,590		1,495,827	40,668,906
1991	348,553	12,259,753	1,996,348		5,472	643,392	15,253,518
1992	634,383	96,038,337	2,262,323	404,990		740,618	100,080,651
1993	462,819	27,969,409	1,081,175		36,935	322,205	29,872,543
1994	642,242	29,432,768	3,297,621	240,462		830,857	34,443,950
1995	474,460	19, 179,496	1,295,273		53,056	1,023,479	22,025,764
1996	402,980	28,238,578	800,423	44,386		212,451	29,698,818
1997	365,316	31,439,536	434,327		12,004	143,244	32,394,427

Ex-Vessel value is the value paid to the fishermen; the total value of the fishery is considerably higher. Figures are for both the Central and Northern Districts.
Source: Ruesch and Fox, 1998.

Commercial fishers must hold a drift or set net permit to fish for salmon in the Inlet, and caps on the number of permits are set for each gear group. Only fixed (set) gillnets may be used to harvest salmon north of the Forelands. The Commercial Fisheries Entry Commission issued 577 drift net permits and 738 set net permits for the Cook Inlet area in 1995. About 68 percent of the drift fleet and 84 percent of set net fleet permit holders were Alaska residents (Ruesch & Fox, 1996:9).

The drift net fleet fishes primarily in the mid-channel and east tide rips. Regular fishing periods are Mondays and Fridays, and on these days the fleet can fish anywhere in the Central District. The drift net fleet is restricted from the main body of the inlet (beyond three miles), on days other than Mondays and Fridays, to prevent inadvertent harvest of salmon headed for upper Inlet streams. During periods of abundant returns to the Kenai and Kasilof Rivers, additional harvest periods are allowed in the Eastside Corridor (Trasky, 1995:5),

which was established because there are no tidal rips in this area, and specific stocks are present in the corridor making their way to natal streams (KPBPC, 1994:10-11). This corridor or use area extends three miles offshore along the Kenai Peninsula between Ninilchik and Collier's Dock at Nikiski. (See Figure 5.3)

The set net fishery takes place along the entire east side of the upper Inlet, along the shore from Ninilchik north to Boulder Point; on Kalgin Island; and along portions of the western shore of the inlet (Trasky, 1995:5, citing to ADF&G, 1994b; Ruesch and Fox, 1995).

Average prices paid for commercially harvested salmon in Upper Cook Inlet are presented in Table 4.5. Prices are based on random fish ticket averages and do not include post-season adjustments.

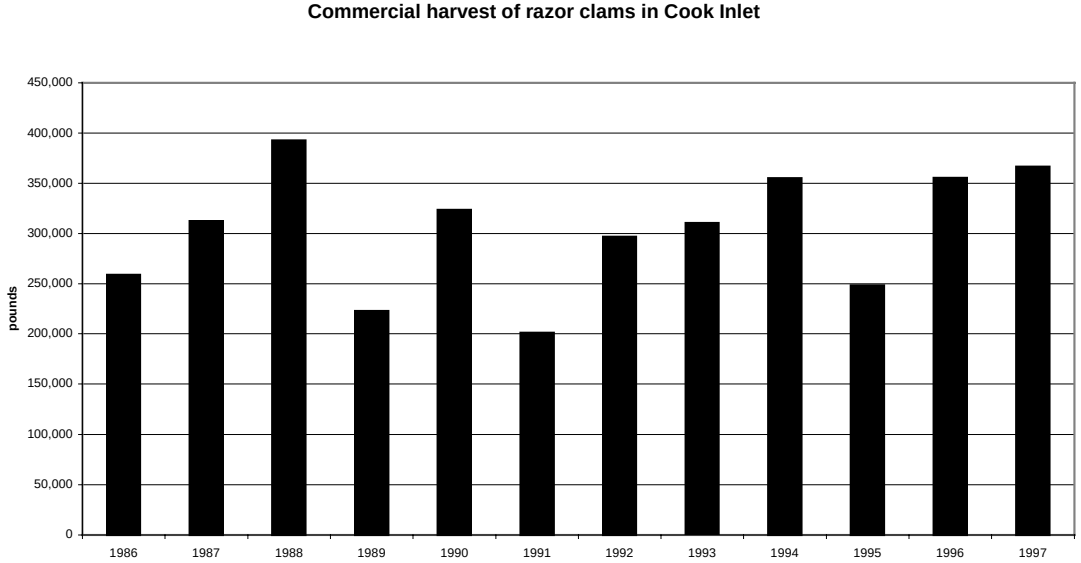
Another commercially important stock harvested is razor clams. Razor clams are commercially harvested on the west side of Cook Inlet, from Crescent River to Redoubt Point, principally from the Polly Creek area. The eastern shoreline of Cook Inlet has been closed to commercial harvest since 1959. Currently, clams must be taken by hand as the use of mechanical harvesters is not permitted. Annual harvests since 1990 are depicted in Figure 4.5 (Trasky, 1995:6, citing to Ruesch and Fox, 1995)(Ruesch and Fox, 1997).

Table 4.5 Average price paid for Upper Cook Inlet Salmon

Year	Chinook	Sockeye	Coho	Pink	Chum
1986	$0.90	$1.40	$0.60	$0.15	$0.38
1987	1.40	1.50	0.80	0.22	0.45
1988	1.30	2.47	1.20	0.37	0.76
1989	1.25	1.70	0.75	0.40	0.47
1990	1.20	1.55	0.75	0.25	0.60
1991	1.20	1.00	0.77	0.12	0.35
1992	1.50	1.60	0.75	0.15	0.40
1993	1.20	1.00	0.60	0.12	0.45
1994	1.00	1.45	0.80	0.12	0.40
1995	1.00	1.15	0.45	0.12	0.27
1996	1.00	1.15	0.40	0.05	0.19
1997	1.00	1.15	0.45	0.05	0.19

Source: Ruesch & Fox, 1998

Figure 4.5 Cook Inlet Commercial Razor Clam Harvest



Source: Ruesch & Fox, 1997

Halibut are commercially harvested in or near the sale area and both halibut and sablefish are landed at ports in the region, however these species are normally not found north of Anchor Point. Effort in the sablefish fishery has ranged from 1 to 12 vessels in Cook Inlet. No sablefish were landed in Cook Inlet in 1996. Harvest by port of landing for halibut and sablefish are depicted in Table 4.6. Harvest statistics for Cook Inlet waters are grouped with harvests from Gulf of Alaska waters from Kodiak to Southeast. The 1997 average price per pound for halibut was $2.35. Average prices per pound for 1996 and 1995 were $2.27 and $2.00 respectively (NPFMC, 1998).

Pacific herring were also harvested in the sale area until a decline in stocks forced a closure of the fishery in Cook Inlet. The commercial herring fishery in upper Cook Inlet began in 1973. A modest harvest occurred in Tuxedni Bay and the Clam Gulch area up to 1987. After the 1988 season, a significant decrease in herring abundance was observed in Tuxedni Bay, and the fishery was closed in 1992. Indications of similar population declines in other areas of upper Cook Inlet resulted in the closure of the entire herring fishery in 1993. The 1996 season was the fourth year of total closure of the upper Cook Inlet area which is expected to last several more years to allow herring populations to recover (Reusch and Fox, 1996:2).

Table 4.6 Halibut and Sablefish harvest by Port of Landing

1997				
	Halibut		Sablefish	
Port	Vessel landings	Total catch (pounds)	Vessel landings	Total catch (pounds)
Anchorage	-	-	-	-
Homer	854	5,209,125	136	1,020,091
Kasilof	-	-	-	-
Kenai	65	249,207	3	19,149
Nikiski	-	-	-	-
Ninilchik	30	112,421	-	-
1996				
	Halibut		Sablefish	
	Vessel landings	Total catch (pounds)	Vessel landings	Total catch (pounds)
Anchorage	1	2,997	-	-
Homer	763	3,943,651	157	1,232,451
Kasilof	3	2,822	-	-
Kenai	71	364,276	3	6,115
Nikiski	5	14,081	1	1,679
Ninilchik	21	60,200	-	-
1995				
	Halibut		Sablefish	
	Vessel landings	Total catch (pounds)	Vessel landings	Total catch (pounds)
Anchorage	6	15,149	-	-
Homer	732	3,140,913	154	1,275,575
Kasilof	2	6,557	-	-
Kenai	104	266,713	14	332,617
Nikiski	10	34,647	2	49,220
Ninilchik	29	80,532	1	95
Source: NMFS, 1998 (- = no landings reported)				

King, Tanner and Dungeness crab stocks and lower inlet shrimp trawl fisheries are in decline or depressed and no seasons have been opened since 1994. Neither King nor Tanner were fished in 1994 due to low populations (ADF&G, 1995). Shellfish declines are correlated with increased abundance of other benthic-dwelling creatures, such as halibut, cod, skate, and possibly rock sole and flathead sole. Commercial fisheries

for scallop and groundfish occur in the lower Cook Inlet management area, south of the sale acreage (Trasky, 1995:6, citing to Bucher and Hammarstrom, 1993).

Scallops are taken by dredge in the Kamishak Bay area in Cook Inlet. This fishery experienced extreme fishing pressure until the Board of Fisheries restricted entry by designating it super-exclusive. If a fisher chose to fish Kamishak Bay scallops, they are not eligible to fish other scallop fishery zones in the state. Hard shell clams, blue mussels, octopus, green sea urchin, and sea cucumber are harvested from lower Cook Inlet. Hardshell clam harvests are presented in Table 4.7.

Table 4.7 Hardshell Clam Harvests, Cook Inlet Management Area

Year	Permits	Landings	Pacific Littlenecks	Butter Clams	Cockles	Total
1990	**19**	**62**	**35,744**	**0**	**0**	**35,744**
1991	**19**	**78**	**47,486**	**85**	**0**	**47,571**
1992	**21**	**117**	**54,631**	**0**	**0**	**54,631**
1993	**33**	**159**	**63,676**	**0**	**0**	**63,676**
1994	**32**	**104**	**44,291**	**0**	**0**	**44,291**
1995	**21**	**93**	**66,723**	**4,267**	**35**	**71,025**

Source: Kimker, 1996

Under federal management, groundfish landings from Cook Inlet are often grouped together with landings from the North Gulf District. The former management area includes state waters south to Cape Douglas. The latter district includes state waters of the eastern Kenai Peninsula coast to Port Bainbridge. Most rockfish are taken from the North Gulf Coastal District, which does not include lower Cook Inlet waters. In 1996, 13 boats landed 2,083 lbs. of rockfish from the Cook Inlet management area. Less than 700 lbs. of lingcod have been harvested from Cook Inlet since 1987. Pacific cod are also taken from lower Cook Inlet. Annual Cook Inlet landings between 1987 and 1994 ranged from 7,000 lbs. to 1.2 million lbs. harvested with 3 to 132 vessels (see Table 4.8). In 1996, total catch was 837,120 lbs. in 285 landings by 28 vessels. Ninety-three percent of the harvest was taken with pots. Portions of Kachemak Bay and the west side of Cook inlet were closed to groundfish fishing with pots to protect crab resources (ADF&G, 1996). Other Cook Inlet species are counted as bycatch of other fisheries.

Table 4.8 Annual effort and harvest from the Cook Inlet commercial pacific cod fishery

Year	**Vessels**	**Landings**	**Pounds**
1987	132	557	711,214
1988	37	137	211,338
1989	3	3	7,144
1990	34	101	219,894
1991	77	339	932,403
1992	56	269	785,003
1993	29	177	908,053
1994	28	244	1,200,508
1995	52	456	1,394,318
1996	28	285	837,120

Source: ADF&G, 1996

The economic value of commercial fishing is difficult to estimate with the best data based on ex-vessel fish ticket sales. Additionally, participation in a fishery is independent of state residency: any U.S. citizen can participate in commercial fishing in Alaska.

b. Forestry

In 1993, about 89,000 acres of state land on the Kenai Peninsula were infested by spruce bark beetle (DOF, 1995b). In 1996, more than 603,000 acres of the Kenai Peninsula and west side of Cook Inlet were infested (DOF, 1996). Beetles also infest state land on Kalgin Island and on the west side of Cook Inlet (DOF, 1995b:1). Human activities such as fire suppression and improper disposal of slash enhance conditions for beetle outbreaks; as do natural occurrences such as blown down, fire scorched, and flood damaged trees. Fast growing healthy trees are more resistant to beetle attacks than slow growing, unhealthy trees (DOF, undated). The Division of Forestry is considering timber sales on approximately 27,880 acres of land in the KPB affected by spruce bark beetle over the next five years.

Most of the proposed timber sales are designed to utilize dead and dying timber, or to harvest timber with a high likelihood of infestation in the next few years (DOF, 1995a:1). Native and University landowners are also harvesting infested timber. The KPB is planning timber sales on some of the 14,000 acres of Borough land classified for timber management. Some harvesting has occurred to reduce hazards in state campgrounds and federal campgrounds (DOF, 1995b:3).

The U.S. Forest Service offered the Moose Pass Cooperative Project on May 6, 1997. This project consisted of 5,512 acres of beetle-infested timber (2,259 acres were to be sold for cutting and 3,253 acres were to be burned by the Service). The Service received no bids on the initial sale, which required logging by helicopter. A portion of the sale requiring tractor logging was reoffered. Bids were received and a contract was awarded. A coalition of environmental groups filed suit in federal district court and was successful in enjoining the project. The Forest Service withdrew the timber harvest portion of the decision on the Moose Pass Cooperative Project and will not go forward with the contract (ADNR, 1997).

In the past 20 years there have been major logging and mill operations at Jakolof Bay, Rocky-Windy Bay area, Stariski Creek and Tyonek. In the mid-80's all of these operations dramatically decreased or shut down completely due to depressed markets. In 1989, increased market demand for a short period of time renewed logging activity in the Nanwalek and Ninilchik areas and the Chugach Lumber Mill in Seward was operational, but it has since been closed. Again, markets and economic factors have dictated the decline and closing of some operations (KPBEDD, undated).

The ADNR Division of Forestry plans to hold timber sales in and around the sale area (Table 4.9). Most parcels contain spruce beetle infested stands. Commercial timber harvests are managed and regulated under the Forest Practices Act (AS 41.17 and 11 AAC 95). The Act requires the removal of spruce slash as small as 4 inches in diameter and the use of seismic trails or existing roads where possible. Forest harvest plans may require new roads to be temporary only (DOF, 1995a).

More than 1,000,000 acres statewide have been infested with spruce bark beetles during the past six years. The U.S. Forest Service has been directed by Congress to establish a task force, in cooperation with the Kenai Peninsula Borough, to prepare an action plan to manage spruce bark beetle infestations and rehabilitate the infested areas. A Congressional appropriation in the amount of $500,000 has been provided to the U.S. Forest Service to support the efforts of the task force (KPBA, 1997).

Table 4.9 DOF Timber Sales (>200 acres) In or Near Sale Area

Parcel Name	General Location	Size (acres)	Sale Date	Status
Small Lake I	T1N R12W SM	225	FY 96	Sold
Small Lake II	T1N R12W SM	413	FY 97	Sold
East Ninilchik	T1S R13W SM	500	FY 97	Delayed
Moose Pass-Schilter	T4N, R1E SM	400	FY 97	Delayed
Old Sterling PUA	T5S R15W SM	960	FY 98	Delayed
Reflection	T3N R11W SM	360	FY 98	Delayed
Kalgin Island	T4N R15W SM	1,500	FY 98	Sold
Ninilchik Hills	T1S R11W SM	400	FY 98	Delayed
North Ranch	T1S R13W SM	480	FY 98	Delayed
South Ninilchik Block	several townships near Stariski Creek	6,320	FY 98	Delayed
Hillside	T2S R143W SM	1,040	FY 99	On Schedule
Bay View	T1N R11W SM	460	FY 99	On Schedule
Chakok	T4S R14W SM	520	FY 99	On Schedule
Slikok	T4N R11W SM	320	10/1999	On Schedule
Caribou Hills 1	T1S R11W SM	2,423	1/98	Sold
Caribou Hills	T1S R11W SM	3,100	04/2001	
Fox River	T3S R11W	1,000	FY 02	
Point Possession	T11N R12W SM	640	FY 00	On Schedule

Source: Wallingford, 1998.

In FY 1996, Kenai Area timber sold was 12,407 million board feet (MBF), having a sale value of $275,629. No timber was sold in the Kenai Area in FY 1997 due to weak markets. In FY 1996, Matanuska-Susitna timber sales were 927 MBF having an estimated value of $27,810. In FY 1997, Matanuska-Susitna timber sales were 1,247 MBF having a sales value of $25,434. As of March 1998, Kenai Area sales were 17,774 MBF with a sale value of $75,525 (DOF, 1998).

c. Agriculture and Mariculture

Since the 1930s, crops and cattle have been raised in the Matanuska Valley and Kenai Peninsula. Important crops include barley, oats, grass hay, grain hay, and potatoes. Important livestock include beef cattle, milk cows, lamb, and hogs. A commercial dairy operation still operates in the Matanuska Valley and supplies fresh milk, cottage cheese, sour cream, and ice cream to local markets. In 1996, 8,800 acres of hay were harvested in the Matanuska Valley, and 2,400 acres on the Kenai Peninsula (USDA, 1997).

In 1996, 4,200 bushels of barley were produced in the Matanuska Valley and Kenai Peninsula having an ex-farm value of $15,000. In the same year, 3,300 bushels of oats were produced having an ex-farm value of $9,000. In 1996, the Matanuska Valley produced 300 tons of grain hay having an ex-farm value of $51,000. The Matanuska Valley grass hay production of 5,500 tons was worth $1.1 million dollars. In 1996, 2,050 tons of grass hay were produced on the Kenai Peninsula having a value of $408,000 (USDA, 1997).

Potato production in the Matanuska Valley has exceeded $2 million in value since 1989. Less acreage was planted in 1996 and the value of the 101, 600 pound harvest was $1.96 million. Potatoes are also produced and sold on the Kenai Peninsula with a 1996 harvest worth $8,000 (USDA, 1997).

In 1996, there were 50 steers, 50 bulls, 370 calves, and 230 hogs on Matanuska Valley farms. Kenai Peninsula farms had 60 steers, 20 bulls, 50 calves, and 100 hogs. Meat production for the Matanuska Valley and Kenai Peninsula is depicted in Table 4.10 (USDA, 1997).

Table 4.10 Cook Inlet Region Meat Production 1996

	Matanuska Valley		Kenai Peninsula	
	pounds	Value	pounds	Value
Beef and Veal Production (dressed weight)	409,000	$512,000	87,000	$107,000
Pork Production (dressed weight)	123,000	$85,000	16,000	$11,000

Source: USDA, 1997 (* = based on average value of $223 per hog)

Milk production in the Matanuska Valley has declined significantly since the 1980s (See Table 4.11). Milk production on the Kenai Peninsula is tabulated with Tanana Valley production (USDA, 1997).

Table 4.11 Matanuska Valley Milk Production

Year	1989	1990	1991	1992	1993	1994	1995	1996
Pounds	20,900	14,300	10,900	9,800	9,100	9,100	8,200	9,000
Value (millions)	$4.272	$2.954	$2.264	$2.052	$1.904	$1.916	$1.732	$1.902

Source: USDA, 1997

The 1996 value of farm production on the Kenai Peninsula was $549,600; down from 1994, and about one-third the value of 1985 production (KPB, 1997:40).

Mariculture or the farming of shellfish in marine waters of Alaska began in southeast in the early part of this century. Since the passage of the Aquatic Shellfish Act of 1989 by the Alaska legislature, oyster and mussel farming has been firmly established in Prince William Sound and Kachemak Bay. 1995 oyster sales for Southcentral Alaska exceeded $110,000, and the industry employed about 50 persons in Southcentral. In 1995, approximately 163 acres were permitted for aquatic farming in Southcentral Alaska, including 20 acres in Kachemak Bay State Park (ADF&G, 1997). Despite an abundance of clean, nutrient-rich water, the industry suffers from under-capitalization, lack of consistent seed stock supply, and stiff competition from foreign and lower 48 producers whose labor and capital costs are significantly lower. A Native corporation in Seward operates a small shellfish hatchery. A mariculture technical center has been funded by the *Exxon Valdez* Oil Spill Trustee Council and is in the final design phase. The center is expected to be located adjacent to the Seward SeaLife Center (Havelock, 1998).

d. Mining

Commercial mineral extraction in the Cook Inlet and Susitna areas trace their historical impetus to the gold rush of 1898. Mineral resources include heavy metals of gold, silver, chromium, copper, lead, zinc, and nickel. Other valuable subsurface deposits include peat, coal, oil, natural gas, iron ore, and gravel. With the exception of gold, coal, oil, gas, and gravel, few have any significant history of commercial production in the Cook Inlet and Susitna regions (KPBEDD, Undated).

In 1994, minerals were explored at the Johnson River polymetallic property near Iliamna volcano. This project is in the pre-feasibility stage and mineral reserves are estimated at 1.1 million tons of ore (DGGS, 1994:11&59).

Placer miners have produced gold from lode mines near the West Fork River and at Hope. In 1994, three placer mines were active on the Kenai Peninsula, including a small placer paystreak operated by AG Building Supply near Hope (DGGS, 1994:32). Girdwood Mining Co. operates the 10th largest gold mine in Alaska (1995). The operation produces gold and byproduct gravel from patented claims near Girdwood. Small placer operations occur throughout the Cook Inlet and Susitna basins, including mines at Canyon Creek, Yentna-Cache Creek, Lake Creek, and Willow Creek in the Hatcher Pass district (DGGS, 1995).

More than 5 million tons of sand and gravel were produced in the Southcentral area of Alaska for the year 1994; two thirds of which was utilized for highway improvements. Chugach Alaska Corporation sold

nearly 180,000 tons of sand and gravel from various locations throughout the Southcentral region. Gravel was quarried from two locations in the Kenai-Soldotna area (DGGS, 1994:32).

Several sites in the Cook Inlet basin have produced commercial quantities of coal, primarily during the steamship period. Coal deposits were extracted in the Port Graham area until the early 1900's. Coal is collected and used to heat homes locally along the shores of Kachemak Bay and the east shore of Cook Inlet. Coal is found at explored prospects, including mines at Deep Creek, Ninilchik, Falls Creek, Homer, McNeil Canyon, Fritz Creek, Coal Creek, Diamond Creek, and Bluff Pt. (ADNR, 1993b).

Coal beds in the Sterling formation of the Kenai Group exist throughout the Kenai Peninsula and offshore. Many seams can be observed along the bluffs of the north shore of Kachemak Bay. Identified resources of the Kenai field are estimated at 300 million short tons with speculative deposit estimates much higher (DGGS, 1984). The effects of erosion on these coal seams may contribute to higher hydrocarbon levels in marine sediments of Kachemak Bay (For a description of marine water quality, see Chapter Five).

Other coal deposits within or near the sale area include the Beluga and Yentna fields with most of the major minable seams (over 20 feet thick) found in the Tyonek formation of the Kenai Group. One significant seam of the Beluga field averages more than 28 feet thick and crops out along the Chuitna River. The eight square mile Capps field is located just outside the sale area near Tyonek (DGGS, 1994). Identified coal resources of the Susitna lowland are estimated to be 10 billion short tons. The Beluga coal field is located just 12 miles from tidewater and is estimated to contain more than 500 million tons

Interest in developing deposits for export to Pacific Rim nations is active. In 1994, Drven Corporation conducted some environmental baseline monitoring at the Diamond Chuitna open pit coal mine project, located about eight miles west of Tyonek in the Chuitna River area (DGGS, 1994:17). An EIS was issued for this project in 1989, however the project has not gone forward, due to a lack of buyers for the coal (DGGS, 1994).

e. Tourism

The Cook Inlet and Susitna areas are well known for their recreational opportunities and tourism is an important and growing part of most local economies. During the 12-month period from October 1996 through September 1997, Alaska hosted 1.3 million non-resident visitors. More than half arrived by domestic airline, and one-quarter by cruise ship. During that period, non-resident visitors spent an estimated $952 million dollars in Alaska. Over 10,000 visitor industry jobs are in the Southcentral region, more than half of all visitor industry jobs in the state. In 1993, more than half of all visitor spending in Alaska occurred in the southcentral region (ADCED, 1998). Tourism is estimated as a $95 million per year industry on the Kenai Peninsula, including sport and charter fishing, lodging, retail and visitor services (Walters, 1995). In the summer of 1993, Anchorage visitors spent an estimated $163 million (MOA, 1997). The most comprehensive study of Alaska tourism was conducted in 1993.

The summer of 1995 saw the advent of sightseeing tours from Kenai to the west side of Cook Inlet. The annual growth rate for the tourism industry on the Kenai Peninsula is estimated to be seven percent a year (Karp, 1995). During the summer of 1993, over 185,000 out-of-state tourists visited the Kenai Peninsula (KPB, 1995:4).

A significant number of visitors to the Kenai Peninsula are in-state visitors from the Anchorage area. It is estimated that 180,549 Anchorage residents visited the Kenai Peninsula from January of 1990 to March of 1991 and spent an estimated $71 million. Each one of these visitors made an average of 4.34 trips to the Peninsula (KPB, 1995:4). The reliance of the KPB on intrastate travelers is a unique feature for a state, which counts on visitors from outside Alaska to support its tourism industry (AET, 1995:2).

The state division of tourism reported that in the summer of 1993, 27 percent of Alaska's vacationing visitors (173,200) visited the Trans-Alaska Pipeline, making it the 9th most popular attraction in the state. The Valdez Pipeline Terminal was visited by 94,500 Alaska vacationers and the Prudhoe Bay oil fields saw 12,200 pleasure vacationers in 1993. In the same year, the Kenai River was visited by 19 percent (119,200) of Alaska vacationers; Soldotna had 101,600 vacationers; Homer saw 107,600 (McDowell, 1993:137, 140-141). In that survey year, 61 percent (387,100) of all vacation visitors to Alaska saw Anchorage; 208,300 (33 percent) visited Seward; 110,300 (18 percent) visited Palmer; and 104,100 (17 percent) visited Wasilla. In 1993, nearly 50,000 visitors to Alaska saw the Matanuska Glacier. Other attractions within or near the area Hatcher Pass recreation Area and Independence Mine (McDowell, 1993). In FY 1998 Chugach State Park had 70,715 non-resident visitors; Hatcher Pass had 44,409, Independence Mine had 9272, and Kachemak Bay had 16,765 (DPOR, 1998).

One out of two vacationers visiting Southcentral Alaska in the summer of 1993 arrived by domestic air transportation; 25 percent by cruise ship; 18 percent by personal vehicle and the Alcan Highway; and the remainder arrived by ferry or international air transport (McDowell, 1993:172). In the same season, 49 percent of vacationers visiting Southcentral Alaska had package tours, while 17 percent had independent packages, and one in three vacationers traveled independently (McDowell, 1993:174). The spending and travel habits of this independent segment of the vacation/pleasure visitor market are of particular concern for the visitor trade industry along the highway in the sale area.

Asked why vacationers chose to visit Alaska, 54 percent indicated that their main reason was personal, such as family or friend related, special occasion, long time desire, timing considerations, and stage in life. Sixteen percent of visitors surveyed indicated that their main reason for visiting Alaska was attractions and/or appeal. Of those, 9 percent said that natural attractions, like glaciers, were the main reason, 6 percent listed fishing, and one percent identified adventure travel as the main reason for visiting Alaska. The remaining 30 percent of vacationers indicated that the main reason for their choice was that Alaska was recommended by others (8 percent). Other reasons include: they were visiting friends or relatives (7 percent); price or discount considerations (5 percent); and the last 10 percent attributed their choice to other factors, including advertising, promotions, and business (McDowell, 1993:147).

Tourism infrastructure is expanding in some portions of the sale area. Four new hotels have been built in Anchorage since 1995. There are plans for two large visitor centers in and near the sale area. The Alaska Maritime National Wildlife Refuge, has plans for a 15,000 square foot visitor center and headquarters building in Homer. A site has been acquired on Beluga Slough but construction is not anticipated begin until after the year 2000. The North Pacific Volcano Interpretive Center, another large visitor facility planned for the Ninilchik area, has received funding and is in the design phase. This is an interagency project between the USGS and the Kenai Peninsula Borough Economic Development District. Construction is not expected to begin until sometime in the next century (Benson, 1996).

f. Transportation and Trade

People and goods are transported throughout the sale area by plane, boat, automobile and train. A rail link connecting Seward with Anchorage and Fairbanks was completed in 1923. Trucking companies use main roads to transport goods from the Port of Anchorage throughout the railbelt (PN&D, 1993).

Airports include Anchorage International, Merrill Field, Lake's Hood and Spenard, and municipal airports at Wasilla, Palmer, Kenai, Seward, Soldotna, and Homer. Anchorage airport is undergoing expansion. Airfreight continues to grow as the airport becomes a global distribution center for international cargo. Statewide, airfreight exports in 1994 were over $2.6 billion; a 30 percent increase over 1993. Most airfreight

consists of products manufactured in the Lower 48 and shipped through Alaska. More than 1,000 employees worked at the Anchorage International Airport in 1994 (ACIB, 1994).

Alyeska Alloys, L.L.C. intends to build a $150 million dollar iron ore reduction plant at Tyonek. The plant is in the design phase, following site selection and financing agreements. Iron carbide is used in electric arc furnaces to make steel. The existing steel dock at Tyonek will be lengthened. The plant is expected to produce 2,000 metric tons of iron carbide pellets per day. A total of 60 to 70 permanent high-paying positions would be filled from the existing Anchorage-Kenai workforce. The iron ore feedstock would come from Chile and iron carbide would be shipped to Japan. The development is expected to add 22 transits to and from the plant each year in 80,000 dead weight ton Panamax class vessels. An environmental contractor is currently working on design specifications for the plant. The chosen project site and infrastructure may suit expansion of the facility to a capacity of over 6,000 metric tons per day (Alyeska Alloys, 1996).

In the past decade numerous additional port and transportation projects have been proposed. To date, none of these projects have moved forward beyond the "proposed" stage. Port development at Point MacKenzie, across from Ship Creek, has been proposed to accommodate anticipated coal storage and shipment. Success of the development may hinge on coal export agreements, and a future rail spur connecting Wasilla to Pt. MacKenzie may be necessary. Recent (1992) bathymetry soundings by NOAA indicate possible shoaling advance near the proposed port site (PN&D, 1993). Construction of a causeway to link Anchorage with Pt. MacKenzie across Knik Arm has also been proposed. Point MacKenzie port development is pending.

Highway improvements and a new bridge have shortened the time it takes to drive from Anchorage through the Kenai Mountains to the Kenai Peninsula. A road to connect the existing Beluga/Tyonek road system with the Big Lake/Parks Highway system has also been proposed (PN&D, 1993).

g. Petroleum Industry, Support Industry, and Energy Supply and Demand

The upper Cook Inlet and Kenai Peninsula have an association with the petroleum industry that dates back to the 1950's. See Chapter Six for information on historic oil and gas operations within the Cook Inlet region.

Exploration and Production. Petroleum exploration activity has increased recently, especially along the Sterling Highway south of Kenai. In 1996, three gas wells were drilled in the Lewis River/Pretty Creek area, Beluga River lease area, and in the Falls Creek field near Clam Gulch. Other exploratory wells were drilled near Ninilchik and Corea Creek, near Clam Gulch (AOGR, 1996e). Modest exploration activity should continue at the frontiers of the Cook Inlet petroleum basin, and new seismic survey technology may reveal previously hidden exploration targets at or near existing fields. In addition, extension of existing fields or small to moderate size exploration prospects is possible. These include previously missed or untested opportunities within or immediately adjacent to existing properties (AJC, 1995:16). The life of currently declining fields may be extended through extended recovery techniques and utilizing existing facilities.

In 1996, Marathon completed a gas well workover program, spending $12 million to rework seven of its 40 wells in the Cook Inlet region (AOGR, 1996a.) In 1996, Union Texas Petroleum spent $18 million of its capital budget in Alaska, including seismic work on the Kenai Peninsula (AOGR, 1996c). After announcing that it would spend $30 million on exploration, Forcenergy Inc. purchased Marathon Oil Company's interests in Cook Inlet, the West McArthur River field interests of Stewart Petroleum Co., and Redoubt Shoal interests of Danco. It also acquired Cook Inlet leases from Trading Bay Energy, the state, and the federal government (PC, 1998b).

Cook Inlet Region Incorporated (CIRI) is a large landowner with 1.6 million acres of subsurface estate. "CIRI has royalty interests, receiving a share of the production from its own subsurface, a large portion

of which is shared with other Native corporations in Alaska under terms of the ANCSA." (AOGR, 1995d) CIRI owns leases in and has been operator of the West Fork gas field, located east of Kenai. Union Texas Petroleum conducted a three-year exploration program of CIRI lands on the Kenai Peninsula. ARCO had an exploratory lease for a 25,000-acre block in the Tyonek area and recently discovered gas there . In October 1998, Anadarko announced test results from Lone Creek No. 1, at the same location. Anadarko and ARCO are preparing plans to develop the discovery (APC, 1998). In addition, Phillips, ARCO, UTP, and Marathon Oil Co. all hold CIRI oil and gas leases (AOGR, 1995d).

In 1995, Unocal budgeted $64 million for Cook Inlet; a significant portion earmarked for additional wells on platform's Baker, Bruce, Anna and Dillon (AOGR, 1995c). Unocal operates 10 platforms in Cook Inlet, and produces about 18,000 barrels a day. Unocal purchases nearly all of the other oil produced in Cook Inlet with the exception of eastern inlet production, which is refined at the Tesoro refinery at Nikiski. Recently, Unocal and Peak Oilfield Services Inc. signed a five-year contract involving operation of the remaining 10 producing platforms in the inlet. The contract would involve about 130 Peak workers. Ninety-eight percent of those employed under former contracts would keep their jobs. Peak would provide roughnecks, roustabouts, welders, and more for Unocal's operations, maintenance and construction. New work would include welding new pipe, structural modifications, cleaning, upgrading vessels, and upgrading instruments. Peak is owned by CIRI and Nabors Industries. (PC, 1997b).

Unocal's production from Cook Inlet is tied to Unocal's downstream operations with natural gas serving as feedstock for the company's fertilizer plant. Unocal's fertilizer plant requires more than a quarter of the 200-plus billion cubic feet of natural gas consumed a year in the entire Cook Inlet region (AOGR, 1995c). The Kenai fertilizer plant employs about 340 people. The oil and gas unit employs about 240 people in Kenai and 72 in Anchorage. The two units employ about 250 contract workers from other companies. The Kenai fertilizer plant uses about 155 million cubic feet of natural gas per day. In 1995, it produced 1.3 million tons of ammonia and nearly 1.1 million tons of urea (PC, 1996). More recent figures put ammonia production at 670,000 tons. Urea prices peaked in 1995-1996 at $210 to $240 a ton, and by January 1998 had fallen to $80 or $100 a ton. In January 1998, Unocal announced that it expected to lay off an undetermined number of workers from its fertilizer plant, citing a decline in Chinese demand and lower urea market prices (PC, 1998b).

Support Services. The support industry provides $891.8 million, or 27.8 percent of the Kenai Borough's $2 billion tax base (AOGR, 1996f). Direct Support Services include: environmental and wildlife; quality assurance and testing; safety and security; logistics and transportation; legal, financial, and insurance; personnel services; medical, food, and fuel.

Oilfield support needs may include office supplies, vehicle maintenance, lumber, fuel oil, shelving, catering, trash disposal, rental housing, restroom service, and welding supplies. Fabrication Infrastructure includes fabrication shops, port facilities, an assembly site, and transportation equipment, including barges and tugs, trucks and crawlers.

In the past, modules too large to be trucked to the North Slope were built outside of Alaska. "Starting in 1987, truckable modules were proven to be competitive in Alaska through lump sum competitive bidding against Lower 48 and Canadian competition." Around 50 percent of module costs are in materials and equipment. (AOGR, 1996d).

An oilfield module fabrication plant is in operation at Nikiski and will deliver modules by barge to the North Slope for the Alpine Development project. Another fabrication plant is in operation at the Port of Anchorage to provide modules for BP's Northstar Development project (PI, 1997).

Energy Supply and Demand. Most residents of the sale area heat their homes with natural gas or gas-generated electricity. Residents of rural communities burn wood or coal to supplement heating homes and fuel

oil is also used to heat homes, especially in communities off the highway system. Coal is collected along the bluffs of north Kachemak Bay and along the bluffs of Cook Inlet's east shore.

Total Cook Inlet gas reserves are estimated at 3.066 trillion cubic feet; of which only 88 billion cubic feet remain undeveloped (Beasley, 1998). Of the 225 billion cubic feet consumed in 1996, 60 percent is sold to two major industrial users: 24 percent to Unocal for urea production, and 36 percent to Phillips-Marathon Plant for LNG production. The remainder went to power generation (16 percent), utility gas (14 percent), and 9 percent went to field operations and other uses (Beasley, 1998).

Natural gas from the west side of Cook Inlet supplies the Beluga Power station (located north of Tyonek) which is connected by intertie to Anchorage. Gas ultimately generates all electricity for the Anchorage area, as well as all communities in the Cook Inlet basin that are connected to the electric power grid. Power is also generated by the Bradley Hydroelectric dam, located in upper Kachemak Bay. From Talkeetna to Homer, electric power is derived from Cook Inlet natural gas and Bradley Lake hydro. Enstar purchases gas from Unocal, and then pipes it to consumers in Anchorage and beyond. Enstar is currently adding line in the Lazy Mountain and Butte areas, and has won the rights to deliver natural gas to Homer by 2000 (Homer News, 1997). Electric power for lighting and heating water is also derived from private wind and solar units and several Alaska companies manufacture solar products.

Enstar has obtained the rights to construct a pipeline to Homer from the nearby North Fork Gas Field. The North Fork field was discovered and drilled in 1965 by Standard Oil, but has yet to produce. Soldotna-based Gas-Pro Alaska bought some of the North Fork Field from Unocal in 1996 and hopes to be Enstar's supplier. According to Gas-Pro co-owner Phil Lefleur, the supply is presently enough to supply Homer for a couple of years. Neither Enstar nor DOG officials are aware of any other companies with firm plans to do exploration on fields north of Homer (Homer News, 1997). According to Enstar president Dick Barnes, Enstar currently has contracts to meet demand until 2001. Phillips Petroleum and Marathon Oil Co. currently have permits to ship Cook Inlet gas to Asia (via the LNG plant), but the permits expire in 2004. Four firms, including Unocal are protesting an application to allow Phillips and Marathon to continue shipping gas to Asia; a decision made by the U.S. Department of Energy. Phillips and Marathon have said that if they cannot keep exporting, it would mean closure of the Kenai plant, which provides 400 jobs and almost $24 million a year in state and local taxes. Opponents of the export permit say continued exports could mean a shortfall for users in Southcentral Alaska beginning after the turn of the century, and that may mean higher prices for consumers. Additionally, because existing fields are declining, gas would be harder to deliver on an annual or daily basis. Federal law requires that exports of natural gas be in the public interest. Proponents of the export permit say that nationally there is an oversupply of natural gas and that as supplies are drawn down, there will be incentives to find new gas reserves (ADN, 1997d). Consumer demand for Cook Inlet gas is on the rise. Enstar adds 1,500 to 2,000 new customers annually; equivalent to a customer growth rate of between 1.5 and 2.0 percent per year (Barnes, 1997).

Alaska Intrastate Gas Co. plans to construct a $60 million LNG plant at Whittier, and has completed an application to the Alaska Public Utilities Commission to distribute natural gas in 19 Alaska communities, mostly in Southeast. The company plans to obtain gas from one or more Cook Inlet producers and ship it to Whittier using an existing pipeline. APUC officials have raised concerns about the company's lack of gas supply and firm financing plan for the project (AJC, 1996a).

The Sunfish prospect was once thought to contain 750 million barrels of oil, but owners Arco and Phillips announced that the field had significantly less crude reserves. DO&G estimates the field to contain about 25 or more million barrels (Beasley, 1997). In March 1995, Cook Inlet's biggest leaseholder (ARCO Alaska Inc.) gave up 60,733 acres or nearly a third of the company's lease holdings. Phillips Petroleum relinquished 38,760 acres, Unocal dropped 16,138 acres, and Marathon dropped 16,138 acres. Many offshore leases that were relinquished were located near Sunfish prospect. (AOGR, 1995a). Phillips Petroleum Co. and

Arco Alaska Inc. have reached an agreement allowing Phillips to conduct delineation drilling of Sunfish, which it renamed the Tyonek Deep prospect. Under the deal, Arco would convert its 60 percent working interest in the Sunfish prospect into a sliding scale, overriding royalty interest on any future production. In February 1998, Phillips announced that its Tyonek Deep delineation well was successful. Phillips plans to use the existing drilling rig to drill two development wells by mid-summer 1998. Engineering studies have been initiated for design of pipeline and production facilities capable of processing 5,000 bpd as early as mid-1999 (Phillips Petroleum Co., 1998). Phillips owns 100 percent of the shallow production from the North Cook Inlet gas unit. Since 1969, the gas has been liquefied at the company's LNG facility at Nikiski for export to Japan (AP, 1997).

3. Recreational Activity

Recreation activities in the Cook Inlet and Susitna regions include:

- Berry picking
- Bird watching
- Dog sledding
- Rock hunting
- Snow shoeing
- Hang gliding
- Cross-country skiing
- Boat launch site use
- Off-road driving
- Mountaineering
- Snow machining
- Horseback riding
- Rafting
- Kayaking
- Flying
- Hiking
- Fishing
- Canoeing
- Camping
- Boating
- Hunting
- Photography
- Biking
- Wildlife viewing

From: Susitna Basin Land Use/Recreation Atlas, ADNR, USDA, 1980

a. Important Habitats of the Cook Inlet Area

The Cook Inlet area includes many areas established by state or federal law to protect and preserve natural habitat and wildlife populations and to ensure that the public continues to have use of these wildlife resources (Trasky, 1995:9). This region includes all or portions of several legislatively designated special areas. Additionally, the area considered in this finding is adjacent to or near other important designations described below (see figure 4.6).

Cumulative effects on habitats, fish and wildlife, and human uses are discussed in Chapter Six. In addition to mitigation measures, other relevant state and federal laws protect habitat values (See Chapter Eight and Appendix B). Oil and gas activities may also be restricted by refuge or area management plans. Mitigation measures proposed to protect habitat values are presented in Chapter Nine.

i. Legislatively Designated Areas

Susitna Basin Recreational Rivers

The Recreation Rivers Act of 1988 established mile-wide river corridors along the Little Susitna, Deshka, Talkeetna, Talchulitna Rivers and Lake, Moose, Kroto, and Alexander Creeks. Only Lake and Alexander Creek, and the Little Susitna River are within the sale area. This Act keeps the recreational rivers in public ownership, identifies purposes of the designation, and provides management intent. Access, commercial uses, and development within the recreational river's area is controlled through a management plan and advisory board. Limits are imposed on motorized boat access to some portions of some rivers in order to maintain the quality of recreational experience, especially during summer fishing season. Several active placer mines and a few communities are located upstream of these river corridors.

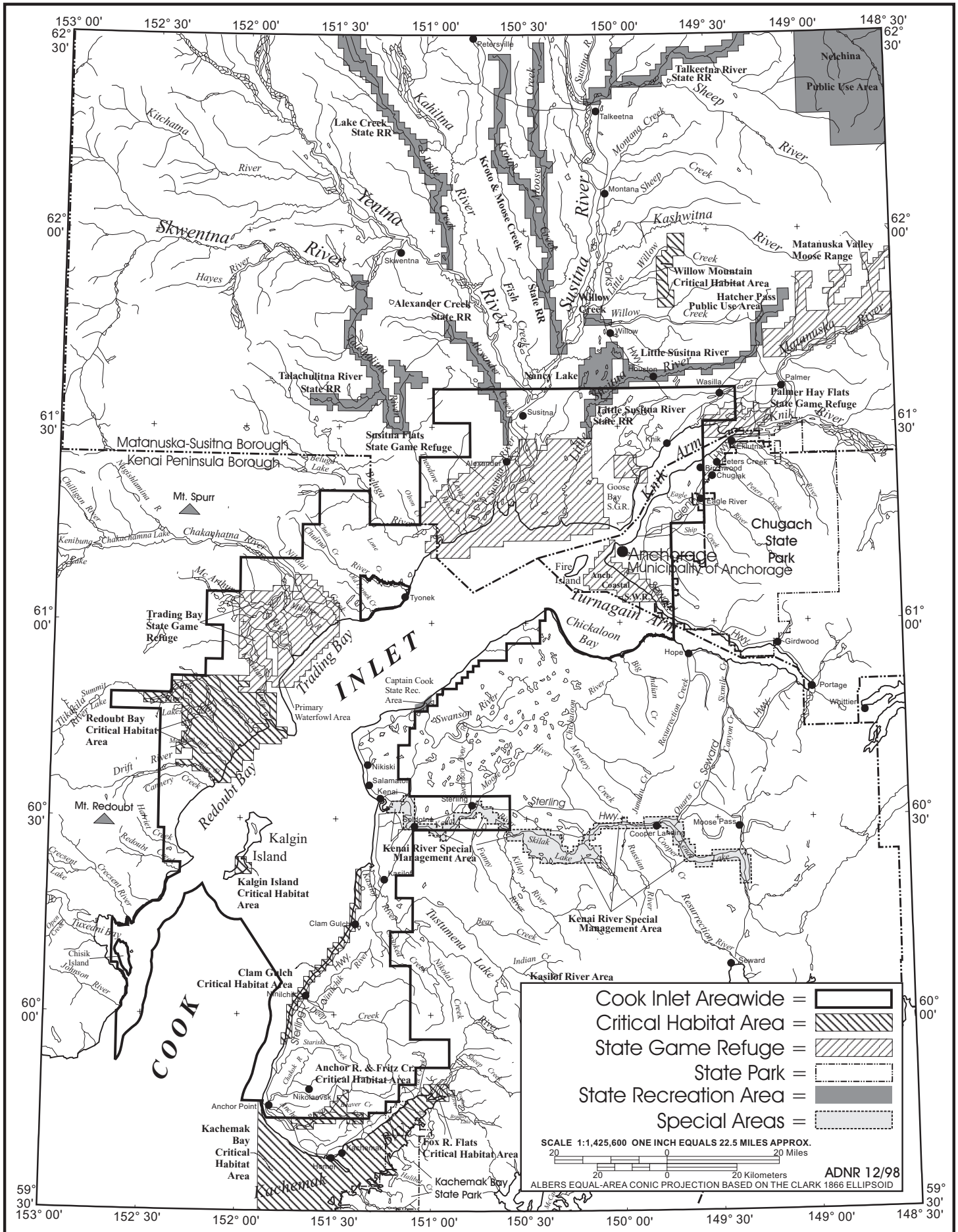


FIGURE 4.6 Legislatively Designated Areas

Nancy Lake State Recreation Area

Nancy Lake State Recreation Area was established in 1966 and includes 22,600 acres of prime recreational habitat. This recreation area is dotted with lakes and supports fishing, wildlife viewing, canoeing, and camping in summer, and skiing and snow machining in winter. Private land inholdings and cabins dot several lakes and some residents live year-round on Nancy Lake. The northern boundary of the lease sale area overlaps the southern tip (1,720 acres) of the recreation area at Skeetna Lake. Surface-entry into the recreation area is prohibited. See Chapter Nine.

Susitna Flats State Game Refuge

Susitna Flats State Game Refuge was established in 1976 to provide protection for fish and wildlife populations and is important for waterfowl nesting, feeding and migration. The refuge also provides habitat for calving moose, feeding bears, and spawning salmon. As many as 100,000 Canada geese are present on the Flats in May. The refuge also supports several thousand sandhill cranes and swans. Northern phalaropes, dowitchers, godwits, whimbrels, snipe, yellowlegs, sandpipers, plovers, and dunlin are among the most abundant of shorebirds. About 10,000 mallards, pintails, and green-winged teal ducks nest in the coastal fringe of marsh ponds and sedge meadows of the refuge. In addition to both brown and black bears, moose, beaver, mink, otter, muskrat, coyote, and wolf also utilize the refuge. Beluga whales congregate near the mouth of the Susitna River to calve and breed, and feed on Hooligan in late May and June. Tyonek residents hunt waterfowl, harbor seals and beluga whale on the refuge (ADF&G, 1988:A-25).

Susitna Flats SGR is known for its public uses, notably wildlife viewing, horseback riding, and hunting. Approximately ten percent of the statewide waterfowl harvest comes from Susitna Flats. Many hunters land float planes to access the refuge's lakes. The Theodore and Lewis Rivers are popular fly-in fishing streams for king salmon from late May through June. Boaters access the refuge from Ship Creek in Anchorage. The Little Susitna River also attracts recreationists and hunters via overland on a rough 4-wheel drive trail. Producing gas fields within this refuge include Pretty Creek, Lewis River, Ivan River and Stump Lake. Natural gas from these fields is used to generate electricity and heat energy for most Southcentral Alaska communities.

Palmer Hay Flats State Game Refuge

Located at the head of Knik Arm, the Palmer Hay Flats SGR was established by the legislature in 1975 as a hunting and wildlife habitat protection area. About 17 percent of the refuge's 28,000 acres are included in the sale area north of Palmer Slough. This important wetland habitat also provides recreation, horseback riding, skiing, snow machining, and hunting opportunities for residents. Currently there is no oil or gas activity in the refuge. Surface-entry into the refuge is prohibited. See Chapter Nine.

Goose Bay State Game Refuge

In 1975, the legislature established this game refuge which encompasses 11,000 acres of tidelands and salt marsh habitat important to waterfowl and fish. Located across from Eagle River Flats on Knik Arm, the refuge is surrounded by residential development. Currently there is no oil or gas activity in the refuge. Surface-entry into the refuge is prohibited. See Chapter Nine.

Anchorage Coastal Wildlife Refuge

The Anchorage Coastal Wildlife Refuge was established in 1988 and encompasses 33,800 acres between Point Woronzof and Potter Marsh. Ducks, geese, and shorebirds are the most visible species on the refuge. Several species of anadromous and freshwater fish are found in the refuge and occasionally large mammals such as moose, coyotes, and black bear are encountered. The refuge is heavily used by residents of Anchorage and is one of the most popular attractions in the state. Thousands of people go to the refuge each year to view wildlife. Waterfowl hunting is allowed in portions of the refuge. Area residents also enjoy the

refuge for other seasonal activities such as ice-skating and cross-country skiing (Trasky, 1995 citing to ADF&G 1991d). Surface-entry into the refuge is prohibited. See Chapter Nine.

Trading Bay State Game Refuge

The Trading Bay SGR is located along the northwest shore of Cook Inlet, and its 162,700 acres encompasses some of the region's most productive coastal wetlands and tideflats. Both the wetlands and tideflats are known for a variety of fish and wildlife species. The Trading Bay SGR was established to protect waterfowl nesting, feeding and migration areas, moose calving areas, spring and fall bear feeding areas, and salmon spawning and rearing habitats. The first oil and gas leases were issued in this area in 1961, prior to the establishment of the Trading Bay SGR in 1976. Oil and gas activities are permitted by statute within the Trading Bay SGR, when compatible with the purpose for which the state game refuge was established. Current producing fields near the refuge include Nikolai Creek, Trading Bay and McArthur River. The Trading Bay production facility is sited just south of the refuge. Oil and gas are also produced from about 10 platforms offshore. Restrictions on activities in this special area apply. See mitigation measures, Chapter Nine.

Redoubt Bay Critical Habitat Area

The Redoubt Bay CHA, immediately to the south of the Trading Bay SGR, was created in 1989 and includes 164,400 acres. The first oil and gas leases were issued in this area in 1961. While both the Trading Bay SGR and the Redoubt Bay CHA were established to protect a variety of fish and wildlife species, they are best known for their prime waterfowl habitat (Trasky, 1995:9, citing to ADF&G, 1989a; ADF&G, 1991a and b; ADF&G, 1994b). Oil and gas activities are permitted by statute within the Redoubt Bay CHA, when compatible with the purpose for which the critical habitat area was established. Current producing fields near the CHA include West Forelands and West McArthur River. The Drift River oil storage and transfer terminal is located adjacent to the CHA boundary on the south side of the Drift River. Restrictions on activities in this special area apply. See mitigation measures, Chapter Nine.

Kalgin Island Critical Habitat Area

Located on Kalgin Island, 20 miles southwest of Kenai, this CHA was established in 1972, and includes a small expanse of wetlands (3,520 acres) surrounding Swamp Creek. This area provides spring and fall resting and feeding habitat for swans, geese, ducks, and shorebirds and is an important alternative habitat used each year by a portion of the waterfowl that use nearby Redoubt Bay wetlands. Few people visit this special area, in part, because of its remote and relatively inaccessible location. However, setnet fishing for salmon occurs along the shore in summer, and boaters enjoy opportunities for wildlife watching and beach combing (Trasky, 1995:11, citing to ADF&G, 1995b). Currently there is no oil and gas activity on Kalgin Island, however some exploration has occurred. Surface-entry into the critical habitat area is prohibited. See Chapter Nine.

Clam Gulch Critical Habitat Area

Clam Gulch CHA was created in 1976 and includes 3,820 acres of tide and submerged lands from Cape Kasilof south to Happy Valley. As indicated by the name, this area is noted for its prolific razor clam beds. In addition, all five species of salmon occur in nearshore waters during summer; and numerous species of birds can be seen flying along the shore. During spring, many waterfowl and shorebirds pause to rest and feed at the mouth of Deep Creek (Trasky, 1995:12, citing to ADF&G, 1986; ADF&G 1991 b). Some CHA lands are currently leased and companies are exploring the area's petroleum potential *(See Exploration History, Chapter Six*). The Falls Creek gas field is located within the CHA, although it is currently not producing. Surface-entry into the critical habitat area is prohibited. See Chapter Nine.

Anchor River and Fritz Creek Critical Habitat Area

The Anchor River and Fritz Creek CHA was established in 1985, and encompasses 18,600 acres of Anchor River and Fritz Creek drainages. This special area was created primarily because of its regional significance as a moose winter range and to control hunting pressure. About 60 percent of the CHA is included in the sale area. No oil or gas production exists in the CHA. The North Fork gas field, located north of the CHA, was delineated in the 1960s but is not a producing field. Surface-entry into the critical habitat area is prohibited. See Chapter Nine.

ii. Other important habitats near the sale area

Chugach State Park

Chugach State Park lies adjacent to the eastern boundary of the sale area in the Chugach mountains near Anchorage. The park's 502,450 acres of wilderness provide important habitat for moose, sheep, mountain goat, brown and black bear, wolves, porcupines, and other furbearers and riparian animals. The park, established in 1970, also provides recreation, camping, hunting, and mining opportunities for residents and tourists.

Kenai National Wildlife Refuge

The Kenai National Wildlife Refuge lies east of the sale area throughout the Kenai Peninsula. The refuge consists of 1,970,000 acres of relatively undisturbed wilderness and supports habitat for Kenai wildlife, including caribou, moose, brown bear, mountain goat, Dall sheep, bald eagles and peregrine falcons. The headwaters of important salmon streams are located in the refuge, including the Kenai, Kasilof, Anchor and Fox Rivers. Within the federal wildlife refuge system lies the Kenai National Moose Range, established in 1941. The state designated the Kenai National Moose Range (2,048,000 acres) as a State Game Refuge in 1960 under AS 16.20.030(a)(8), although the range is managed by the USFWS. The BLM manages federal oil and gas leases in the Swanson River and Beaver Creek oil fields, located north of Soldotna.

Kachemak Bay Critical Habitat Area

Though there are no tracts within the bay or CHA, a small onshore portion of the sale area is adjacent to the Kachemak Bay CHA just below Anchor Point. The Kachemak Bay CHA was established in 1974, and includes approximately 222,000 acres of tide and submerged lands. The CHA was created because of the extraordinary abundance and diversity of marine life that provides a basis for one of the state's most important fisheries. Oil and gas development is prohibited in the waters of Kachemak Bay.

Fox River Flats Critical Habitat Area

Onshore acreage in the southern portion of the sale area is near the Fox River Flats CHA. This CHA was created in 1972, and encompasses 6,780 acres of intertidal mudflats and marshlands at the head of Kachemak Bay. This area is noted for its waterfowl and especially as a shorebird staging area in the spring.

Tuxedni State Game Refuge

The southern extension of the sale area surrounds Chisik Island in Tuxedni Bay. The legislature designated this 15,400 acre island habitat as a state game refuge in 1960. The island is included in the Lake Clark National Park and Preserve and is managed by USFWS. This marine region provides important habitat for shorebirds, marine birds, seals, sea otter, Steller sea lion and both beluga and killer whales.

Lake Clark National Park and Preserve

This national park was created by ANILCA in 1980, encompasses more than 4.4 million acres, and lies to the west of the sale area. The park provides important undisturbed habitat for caribou, moose, bear,

wolf, sheep, birds, and fish. The park and preserve is also known for its volcanoes, glaciers, wild rivers, lakes, waterfalls, and alpine meadows. The enacting legislation of this national park requires that it be managed, among other things, to maintain unimpaired the scenic beauty and quality of the Alaska Range and the Aleutian Range (MMS, 1995:III.C.20).

b. Personal Use Sport Fishing

Nonresident hunting and fishing is an important part of the Kenai Peninsula tourism industry. Sport fish activities, including guided and unguided efforts occurring in fresh and saltwater are considered in this final finding for the Cook Inlet Areawide Lease Sale. Specific catch information for rivers in the sale area is found in ADF&G's Harvest, Catch, and Participation in Alaska Sport Fisheries During 1997 (Howe, et al, 1998).

Several sport fisheries occur within the areawide sale area in both freshwater and marine waters, targeting salmon, halibut, several species of shellfish, rainbow trout, burbot, whitefish, Dolly Varden, and others (Howe, Fidler, and Mills, 1995). About 71 percent of state's total fishing days in 1996 were spent in the Southcentral Region, which encompasses the areawide sale area. The Cook Inlet area experienced about 50 percent of the state's total fishing days (the Kenai Peninsula 37 percent and the Kenai River 13 percent) (Howe, et al, 1997:4). Since 1986, the number of days fished has increased 28 percent, an average of 3 percent per year (Howe, et al, 1997:5).

Today, more anglers in Southcentral Alaska are non-residents than in past years. In 1991 the total number of fishers using the Southcentral area was 318,862. About 62.5 percent were Alaska residents, and 37.5 percent were nonresidents. In 1996 Southcentral fishers totaled 345,887; 53.7 percent were residents, 46.3 percent nonresidents (Howe, et al, 1997:16). Catches in the Southcentral Region were up by about 15 percent between 1995 and 1996 (Howe, et al, 1997: 5).

Important marine sport fishing areas for salmon and halibut include the nearshore waters at the mouths of the Deep Creek, Kenai and Anchor Rivers. Activity is intense off the mouths of these rivers between May and August. Recreational harvesting of razor clams occurs on west side beaches in the Polly Creek and Crescent River area and on east side beaches from Anchor Point to Ninilchik (Trasky, 1995:6, citing to RPI, 1994; Howe, Fidler, and Mills, 1995). Annual harvests since 1986 for the lease sale area are listed in Table 4.13.

Table 4.12 Recreational Razor Clam Harvest in the Sale Vicinity

Year	West Cook Inlet- West Susitna River Drainages	Kenai Peninsula
1986	111,048	1,165,665
1987	107,022	1,004,875
1988	58,784	1,189,682
1989	57,603	849,536
1990	48,752	979,353
1991	27,658	1,176,433
1992	31,066	1,176,349
1993	39,989	963,054
1994	22,239	1,286,614
1995	14,878	1,180,958
1996	30,671	1,270868
1997	22,935	1,309,943

Source: Howe, et al, 1998: 59.

Freshwater sport fishing occurs in most of the area streams. Particularly popular areas include rivers, streams and creeks in the drainages of the Big Lake area, Knik Arm, Anchorage, West Cook Inlet-West Susitna River and the Kenai Peninsula. Popular waterways include Lake Creek, Alexander Creek and the Little Susitna. The Kustatan, Susitna and Chutna Rivers are also popular for sportfishing (Trasky, 1997).

One of the most utilized waterbodies in the sale area is the Kenai River. In 1996, about 68,000 non-guided anglers fished the Kenai River for a total of 269,233 fishing days (Howe, et al, 1997: 92). More than 40,000 guided anglers fished the Kenai River in 1996 with most activity occurring between the coast and the Soldotna bridge (Howe, et al, 1997: 94). More than 3,000 anglers made at least one trip to west Cook Inlet saltwater fishing grounds in 1996 (ADF&G, 1997:90). Over 51,000 anglers in private boats and 90,000 in chartered boats fished the Kenai Peninsula saltwater area in 1996 (Howe, et al, 1997:98). Almost 13,000 anglers spent a total of 32,275 days sport fishing on the Homer spit in 1996 (Howe, et al, 1997:98).

More than 15,000 individuals harvested clams in the Anchor River and Deep Creek areas. Slightly more than 13,000 individuals harvested clams at Clam Gulch Beach in 1996. In the same year, about 6,200 individuals sought clams in Kachemak Bay (Homer) (Howe, et al, 1997:100).

c. Personal Use Hunting and Trapping

The ADF&G controls and monitors the harvest of wildlife through game management units (GMU). The sale area encompasses part of three GMUs: 14, 15, and 16. GMU 14 includes the drainage area north of Turnagain Arm and east of the Susitna River. GMU 15 includes the Kenai Peninsula west of the Kenai Mountains. GMU 16 includes the Susitna Valley west of the Susitna River to the Alaska Range. ADF&G compiles harvest statistics for entire GMUs, and a break-down for only the sale area is not available. Thus the harvest statistics in Table 4.14 reflect the harvest taken from entire GMUs.

Moose are harvested on both sides of Cook Inlet, with most of the hunting from the Kenai Peninsula northwest to the Susitna River. The southern tracts of the sale area encompass a large portion of a heavily used moose hunting area. Between 1990 and 1994, an average of 29 percent of the total hunters and 41 percent of the total moose harvest on the Kenai Peninsula occurred south of the Kasilof River and Tustumena Lake. A majority of the effort and harvest there occurred in just four drainages: the Anchor and Ninilchik rivers and Stariski and Deep creeks. The Susitna River area is also a heavily used moose hunting area (Trasky, 1997).

Both black and brown bears are harvested in the sale area. On the west side of Cook Inlet, an average of 58 brown bears were harvested between 1990 and 1994 with 85 percent of the harvest occurring in between the Yentna and the Drift River. More than 120 black bears are taken from the West Side of the Inlet each year. About 140 black bears were taken on the Kenai Peninsula each year in the early 1990s. During those same years, the annual black bear harvest in the Matanuska-Susitna Valley averaged 73 (Trasky 1997).

Waterfowl (ducks, Canada and white-fronted geese) are also harvested at several locations within the sale area including the Susitna Flats SGR, Goose Bay SGR, Palmer Hay Flats SGR, the Anchorage Coastal Wildlife Refuge, Kenai River flats and Kasilof River area. Between 1989 and 1994, the estimated Cook Inlet region duck and goose harvests were 24,430 and 1,225, respectively. In the Trading Bay SGR, the average annual reported duck harvest from 1988-1990 was 1,336 ducks and between 1988 and 1992 it averaged 1,143. Between 1988 and 1992, the average annual duck harvest from the Palmer Hay Flats SGR and Susitna Flats SGR was 4,343 and 9,496, respectively. In Redoubt Bay CHA, the average annual reported duck harvest was 1,455 for the period 1988 to 1992. At the Kenai River and Kasilof River areas, the average annual reported duck harvests from 1988 to 1992 was 1,934 and 288 ducks, respectively. The combined average annual duck harvest of these six areas accounted for about 27 percent of the total state duck harvest (Trasky, 1997). Canada

and white-fronted geese are also harvested in these areas, but in small quantities (Trasky, 1995:7, citing ADF&G, 1994c).

4. Subsistence

Subsistence hunting, fishing, and trapping occur year-round, throughout the entire region. Subsistence foods include salmon, other fish, big game, small game and furbearers, marine mammals, birds and eggs, marine invertebrates, and plants and berries. The harvest and use of these foods represent activities with significant social and cultural meaning as well as economic importance, especially within Alaska Native communities (MMS, 1995:III.C.6). Subsistence activities tie the community together and provide group identity and community stability (ADNR, 1993a).

Tyonek and Beluga. On the west side of Cook Inlet, residents of Tyonek harvest fish, wildlife, and vegetation from the Susitna River south to Tuxedni Bay, with harvest effort concentrated in areas west and south of Tyonek. Although Tyonek residents harvest a wide variety of subsistence resources, moose and salmon are the most important.

Residents from the village of Beluga, four miles north of Tyonek, also harvest fish and wildlife in and near the sale area (Trasky, 1995:7). The annual round of harvests by Tyonek residents is depicted in Figure 4.7.

Table 4.13 Wildlife Harvest Summary

Species	GMU	90-91	91-92	92-93	93-94	94-95	Average
Beaver	14	155	227	253	236	164	207.0
	15	66	33	92	93	31	63.0
	16	176	228	100	87	66	136.4
	Total	397	488	445	416	261	
Black Bear	14	71	90	80	46	96	76.2
	15	129	159	169	108	170	147.0
	16	126	150	109	114	112	122.2
	Total	326	399	358	268	378	
Brown Bear	14	10	12	11	5	10	9.6
	15	10	10	14	13	16	12.6
	16	55	68	76	40	50	57.8
	Total	75	90	101	58	76	
Coyote	14	n/a	58	42	14	8	24.4
	15	n/a	n/a	n/a	n/a	n/a	
	16	n/a	6	8	42	16	14.4
	Total	n/a	23	25	59	33	
Fox	14	n/a	30	42	16	7	19.0
	15	n/a	n/a	n/a	n/a	n/a	
	16	n/a	6	5	35	9	11.0
	Total	n/a	36	47	51	16	
Lynx	14	13	15	11	10	1	10.0
	15	1	0	2	3	4	2.0
	16	0	1	3	4	0	1.6
	Total	14	16	16	17	5	
Marten	14	n/a	30	60	11	28	15.0
	15	n/a	2	130	0	0	26.4
	16	0	28	0	103	97	45.8
	Total	n/a	60	190	114	125	
Mink	14	n/a	73	113	28	26	48.0
	15	n/a	n/a	n/a	n/a	n/a	
	16	n/a	11	5	14	13	8.6
	Total	n/a	84	118	42	39	

Species	GMU	90-91	91-92	92-93	93-94	94-95	Average
Moose	14	435	800	903	610	723	694.2
	15	390	570	411	586	636	518.6
	16	137	402	377	274	343	306.6
	Total	962	1772	1691	1470	1702	
Mountain Goat	14	32	40	39	29	32	34.4
	15	44	61	72	82	68	65.4
	Total	76	101	111	111	100	
Otter	14	10	26	16	35	30	23.4
	15	21	21	38	51	13	28.8
	16	15	22	14	31	7	17.8
	Total	46	69	68	117	50	
Sheep	14	132	138	124	116	112	124.4
	15	25	26	28	34	33	29.2
	16	18	15	15	17	12	15.4
	Total	175	179	167	167	157	
Wolf	14	2	3	10	7	22	8.8
	15	6	7	16	21	13	12.6
	16	5	5	8	12	29	11.8
	Total	13	15	34	40	64	
Wolverine	14	16	8	9	13	5	10.2
	15	10	3	5	8	12	7.6
	16	8	21	13	12	28	16.4
	Total	34	32	27	33	45	
Caribou (Estimated Harvest by Herd)	Kenai Lowlnd	2	2	1	0	0	
* No open season	Kenai Mtn	7	16	15	29	28	
	Killey River	n/a*	0*	0*	0*	11	
	Total	9	18	16	29	39	

Keyes, 1996.

A subsistence set gillnet fishery provides currently for the harvest of salmon. The annual harvest for the Tyonek subsistence salmon fishery from 1990-1995 is provided in Table 4.14. Chinook salmon are an important part of the subsistence harvest because of their early arrival and large size. Coho salmon are harvested for both subsistence and commercial sale, whereas sockeye, pink, and chum salmon are harvested mostly for commercial sale. Dolly Varden char, rainbow trout, eulachon (hooligan), and clams are also important items of the Tyonek diet. Black bear, porcupine, grouse, ptarmigan, waterfowl, and marine mammals are harvested on an opportunistic basis during fall hunts (ADF&G, 1985b:881).

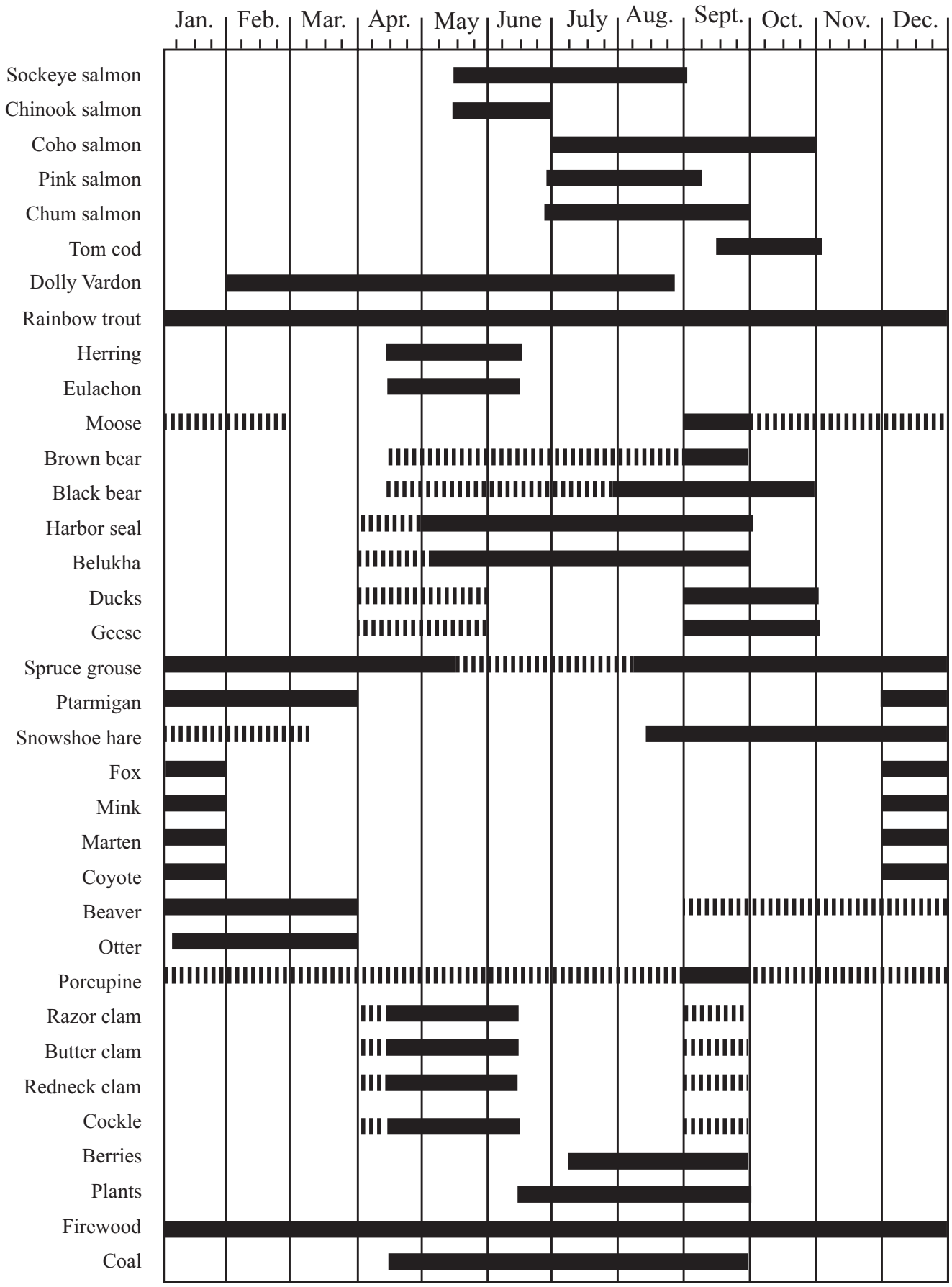
Table 4.14 Tyonek Subsistence Salmon Harvest

Year	No. of permits	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	42	797	92	366	124	10	1,389
1991	57	1,105	25	80	0	0	1,210
1992	57	905	74	234	7	19	1,239
1993	53	1,247	43	36	11	9	1,346
1994	49	840	41	111	0	22	1,014
1995	55	1,271	45	123	14	15	1,468
1996	49	1,032	65	110	21	18	1,246
1997	42	642	94	127	0	8	871

Source: Ruesch and Fox, 1998.

Salmon makes the largest contribution by weight to mean household harvest. Chinook salmon are thoroughly utilized: the flesh is cut into steaks, fillets, and strips for smoking, while heads, tails, fins, backbone, roe and milt sacks, hearts, and stomachs are processed into a variety of traditional products. Besides

FIGURE 4.7 Annual round of harvest activities by Tyonek residents. Solid line indicates time when harvest takes place. Broken line indicates occasional harvest effort. (ADF&G 1985b:880).



chinook salmon, other species of salmon are harvested in smaller quantities for subsistence use (ADF&G, 1985b:882).

Fishing for coho salmon continues into September. Freshwater fish such as Dolly Varden and rainbow trout are caught throughout the summer from local freshwater streams, using rod and reel (ADF&G, 1985b:881).

In September, harvest efforts concentrate on moose. Access to moose hunting areas is through a network of local logging roads or by boat to nearby river drainage's. Fall moose hunts frequently combine fishing and gathering activities. Moose are hunted in Trading Bay; and the main harvest areas for waterfowl are the mouths of Nikolai Creek, Middle River, and McArthur River (Trasky, 1997). After chinook salmon, moose makes the second highest contribution by weight to mean household harvest. Moose meat is hung in a cool place for aging prior to preserving. Choice cuts and portions of moose are eaten fresh, but most moose meat is frozen in freezers (ADF&G, 1985b:882).

Harbor seals are hunted on an opportunistic basis along the shores of Trading and Redoubt Bays. During the summer, villagers also organize hunting trips along offshore areas for beluga whale which are hunted in stream mouths (Trasky, 1995:7, citing to ADF&G, 1994b; Ruesch and Fox, 1995. ADF&G, 1985b:881). Federal marine mammal regulations have allowed Alaska Natives to continue this tradition. Beluga meat is eaten fresh after roasting or boiling and is also preserved by freezing. Beluga blubber is rendered into oil and refrigerated for use in cooking (ADF&G, 1985b:886).

Beluga whales are hunted in stream mouths, and harbor seals are hunted along the shores of Trading and Redoubt bays. Beluga hunting takes place in the upper inlet from Anchorage to the Beluga River, and favorite locations include the mouths of the Susitna, Theodore, and Beluga Rivers. Most hunting occurs between mid-April and mid-October (Stanek, 1994:11). In the last few years, hunting has occurred at the mouth of the Susitna River and more recently towards Knik. Most hunters are not from the Cook Inlet region. Hunters use an open top dory and gear (harpoon and buoy) that minimizes struck and lost situations. The timing of a hunt varies widely because it is based on need. Weather is a big factor in hunting success and Cook Inlet's shallow waters can be very dangerous (Alex, 1998).

Firewood is gathered throughout the year, but wood-gathering activities intensify around October. Gathering of edible plants such as wild celery, wild rhubarb, and rosehips occurs during the summer. Berries picked in season include high and low bush cranberries, salmon berries, blueberries, and crowberries (ADF&G, 1985b:881).

Winter is a time of relatively low activity in the annual cycle of subsistence life for west Cook Inlet residents. Hunting for ptarmigan, spruce grouse, and hare continues through the winter, and trout are caught through the ice. A few Tyonek residents trap furbearers beginning in mid-November and continuing throughout the winter months. Trapping for beaver continues into March (ADF&G, 1985b:882).

Kinship ties affect harvesting, processing, and the distribution and exchange of fish and game. Facilities and equipment such as fishcamps, nets, vehicles, and smokehouses are commonly shared, and wildlife resources are widely distributed throughout the village. Distribution of products occurs from the harvester to recipients, such as the elderly or sick, who do not have the means to produce the products themselves (ADF&G, 1985b:886). Resources are also shared at potlatches during special social events such as, weddings, birthdays, and funerals (Fall 1996).

Knik and Eklutna are the principal communities of the aboriginal residents of the Knik Arm drainage. Today, kinship ties bind the communities of Knik to other towns and cities such as Peters Creek,

Eagle River and Anchorage. Community membership is expressed through attendance at church services, participation in village corporation affairs, and, especially, the sharing of harvested wildlife resources.

Moose meat is still a highly valued and nutritionally significant component of the native diet. In addition, trout are obtained in local streams and lakes; waterfowl hunted along the Susitna Flats; "Indian potatoes" dug near Eklutna; and beaver, muskrat, and lynx trapped up the Knik River. Wood is gathered to heat homes and sweatbaths (Fall, 1981:21). The round of subsistence activities in aboriginal times included a wide variety of seasonally abundant wild resources. Salmon, especially kings, reds, and silvers were the major staple of the diet. The permit for the Native Village of Eklutna Fishery allows the village to operate a single 10-fathom set gillnet in Knik Arm adjacent to the village site or within one-mile of shore in an area from Goose Bay Creek north to Fish Creek. The harvest for the 1997 season totaled 7 chinook, 39 sockeye, 14 coho, 16 pink, and 7 chum salmon (Ruesch & Fox, 1998:22)

Waterfowl, eulachon, seal, freshwater fish, moose, caribou, sheep, small game, furbearers, and numerous plant species are among the other important sources of food and raw materials derived from the natural environment. Over the years non-native population growth and regulatory actions increasingly constrained subsistence fishing in the Knik Arm. In 1971, the subsistence fishery was closed. Commercial catches and sport fishing provide the communities with some salmon, but not enough to meet their needs (Fall, 1981:1).

The Knik Tribal Council Fishery, established in 1993, provides for a subsistence harvest from July 15 to September 30 adjacent to the village site or in an area from Goose Bay Creek to Fish Creek. The harvest for the 1996 season totaled 5 chinook, 163 sockeye, 45 coho and 62 chum salmon. The harvest for the 1997 season totaled 19 chinook, 153 sockeye, 34 coho, and 15 chum salmon (Reusch & Fox, 1998:22).

The Kenaitze have been on the Inlet for centuries making use of its natural resources. Activities such as drying fish, smoking fish, and berry picking have persisted over the years without any direct relationship to size of personal income (Swan, 1981:3). Often the catch is processed (smoked, dried, or canned) by those who don't do the actual taking before it is shared. Thus the number of households having members whom harvest a resource and the number of households using a resource are different (Fall, 1981:21).

The Kenaitze Tribal Fishery was first allowed in 1989. Fishing dates vary from year to year and in 1995 fishing was allowed from May 1 to October 15. Fishing occurs primarilly in marine waters south of themouth of the Kenai River and occasionally immediately upstream of the Warren Ames Bridge in Kenai. The tribal office reported the 1997 harvest as totaling 142 chinook, 2,410 sockeye, 5 pink and 191 coho salmon (Ruesch and Fox, 1998:21).

Ninilchik. Residents of Ninilchik and members of the Kenaitze Tribe subsist primarily on fish resources within the sale area on the east side of Cook Inlet. The major resources harvested are salmon, halibut, clams, and razor clams. The Ninilchik Traditional Council Fishery, established in 1993, provides for a subsistence harvest. Fishing time has varied and in 1995 was permitted from May 8 to September 30. The harvest for the 1997 season totaled 302 chinook, 241 sockeye, 99 coho, and 55 pink salmon (Ruesch and Fox, 1998:21). Moose are also harvested by Ninilchik residents during the fall after the fishing and tourist seasons are over (ADF&G, 1985b:919).

Seldovia and Port Graham and Nanwalek. Residents of these communities do not use the sale area for primary subsistence activities. However, since the *Exxon Valdez* oil spill fouled traditional clamming areas, residents of Nanwalek and Port Graham have used the area around Ninilchik for the harvest of razor clams (ADNR, 1993a:31). Subsistence use of fish, wildlife, and vegetation also occurs outside of the sale area, at the head of Kachemak Bay and along the southern shore of the bay. Residents of Seldovia, Port Graham, and Nanwalek harvest seals, sea lions, and sea otters around Yukon Island and Tutka Bay (Trasky, 1995:8, citing

to Bucher and Hammarstrom, 1994). Waterfowl are harvested primarily in the vicinity of Seldovia Bay, Tutka Bay, China Poot Bay and McKeon Flats, and Fox River Flats south of the sale area. Seabirds and their eggs are also taken. Moose, black bear, and goats are commonly hunted along the shoreline. Port Graham and Nanwalek residents also harvest salmon in Nanwalek and Koyuktolik ("Dogfish") Bay (Trasky, 1995:8, citing to ADF&G, 1993b). Berries are a significant resource to Seldovians, and they are gathered in the largest quantities of all the Kenai Peninsula study communities (ADF&G, 1985b:922). Villagers from Port Graham, Nanwalek, and Seldovia also harvest fish and wildlife in Kachemak Bay and on the Fox River Flats (Trasky, 1995:14, citing to ADF&G 1993b).

Harvest calendars for Nanwalek and Port Graham show that resources, especially salmon, clams, moose, and bear provide large quantities of food during a short period of the year and are preserved for use throughout the year. Other resources like trout, cod, halibut, chiton, snails, and crabs are generally used fresh on a seasonal basis. Marine mammals, mostly harbor seals and sea lions, are highly valued, harvested year-round, and extensively shared. In general, locally procured foods are widely distributed among households in these communities. Salmon taken for domestic use is obtained through a combination of commercial, subsistence, and rod and reel fisheries (ADF&G, 1985b:924). The annual round of harvests by residents of Nanwalek and Port Graham is depicted in Figure 4.10.

A variety of plants are also taken in Kachemak Bay. Bull kelp, rockweed, and brown sea weeds are collected from intertidal areas, while seaside plantain, rye grass, beach pea, wild parsley, and cow parsnip are collected from shoreline areas. Marine invertebrates are harvested in Seldovia, Kasitsna, and Jakolof bays (Trasky, 1995:8, citing to ADF&G, 1993b).

General subsistence and personal use fisheries have existed in upper Cook Inlet since 1991. These programs are open to all Alaskans, native and non-native alike. The dip net fishery takes place on the Kenai, and Kasilof rivers and on Fish Creek. The set gillnet fishery takes place on the Kasilof River from June 21 until closed by emergency order when approximately 5,000 to 10,000 sockeye salmon have been taken. (Ruesch and Fox, 1996:15).

In addition, a general Kachemak Bay subsistence and personal use salmon fishery has occurred since prior to statehood. The fishery targets natural runs returning to the Fox River drainage, and enhanced stocks returning to the Homer Spit fishing lagoon and Fox Creek. In 1993, 326 permits were issued, and 1,990 coho, 463 pink, 44 sockeye, 18 chum, and 6 chinook salmon were harvested (Trasky, 1995:8, citing to Bucher and Hammarstrom, 1994).

Gardening is often overlooked as a means of subsistence, especially in terms of village life. The Russians brought cabbage, potatoes, and turnips to the Kenai. Early Kenai settlers planted subsistence gardens because of the need for fresh vegetables. A variety of wild berries are picked; particularly lowbush cranberries, highbush cranberries, rosehips, blueberries, mossberries and wild raspberries (Fall, 1981:11).

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